

PROFILES OF THE JAMAICAN IRISH POTATO, GINGER, YAM AND ONION INDUSTRIES



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Background

The ***Promotion of Regional Opportunities for Produce through Enterprises and Linkages (PROPEL)*** project is a sustainable economic growth project which aims to increase the value of Caribbean fresh produce accessing high-value markets in the Caribbean and internationally by CAD \$100 million over five years. Funded by the Department of Foreign Affairs, Trade and Development (DFATD) and CHF (aka Canadian Hunger Foundation), the project will work with up to 28,000 farmers, private sector buyers, other value chain actors, and business service providers in eight Caribbean countries to facilitate the safe, effective and efficient movement of fresh produce from farm to fork. The PROPEL regional office is located in Barbados.

The project will act as a catalyst for the development of agricultural production in the fruits and vegetables, roots and tubers, and herbs and spices subsectors to meet High Value Market (HVM) demands. PROPEL defines HVM as markets that demand high standards of quality, safety, timeliness and consistency (e.g. large supermarkets, buyers in the tourism industry – hotels, restaurants, cruise ships, airlines, importers and exporters). PROPEL will support farmers to achieve standards of quality, quantity, and timeliness on a consistent basis through technical assistance and basic inputs. PROPEL will also provide business training and entrepreneurial support to producers to increase their capacity to efficiently plan production, manage their farms and market their produce. Women and youth will be specifically targeted and supported to engage in complementary, entrepreneurial activity tied to the expected employment and linkage opportunities. Finally, PROPEL will work closely with selected financial institutions and business service providers in the region to support greater access by producers to business development services such as credit and market information.

PROPEL's office was established in Jamaica in November, 2013. Earlier, during the same year, the regional office staff held meetings with purchasing staff of 9 HVMs in Jamaica (Brooklyn Supermarket (2 outlets), Mega Mart Supermarket (4 outlets), Pricesmart Supermarket (1 outlet), Hi-Lo Supermarket (14 outlets), Shoppers Fair (1 outlet), Lees Food Fair (1 outlet), Pegasus Hotel, Knutsford Court Hotel and Courtleigh Hotel) to discuss issues related to quality, consistency and safety of fresh produce supply and potential for collaboration with CHF to implement the PROPEL project in Jamaica. Overall, responses indicated that there was a need to improve the quality and consistency of fresh produce supplied to these markets.

The CHF Caribbean Strategic Advisory Committee (SAC), convened in November, 2013, further suggested that PROPEL identify and target specific "high value produce" for access to domestic and, possibly, export markets. In response, this exercise was conducted in December, 2013 to review the Jamaican Irish potato, ginger, yam and onion industries and to recommend strategies for PROPEL's intervention to support the industries in meeting the quality and quantity demands of the domestic and export markets.

Acknowledgement

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Mr. Sylburn Thomas - General Manager, Export Division: Ministry of Agriculture and Fisheries;

Mr. Michael Pryce - Mechanism Data Manager;

Mr. Lenworth Fulton - Chief Executive Officer, Rural Agricultural Development Authority (RADA);

Mr. Don McGlashan - Director General, Ministry of Agriculture and Fisheries.

Section 1 - The Irish Potato Industry

1.0 The Irish Potato Industry in Jamaica and Other CARICOM Countries

Jamaica is the largest producer of Irish potato among the CARICOM countries. Irish potato has been produced in the country for over a century following trials of two varieties of seeds imported from the United Kingdom¹. Favorable demand for the locally grown Irish potato propelled early and ongoing development of the industry, which also suffered sporadic declines due to unavailability of seeds, adverse weather and globalization. Within the last five years, Government and the private sector have focused attention on growth and sustainability of the industry for food security and for national economic development.

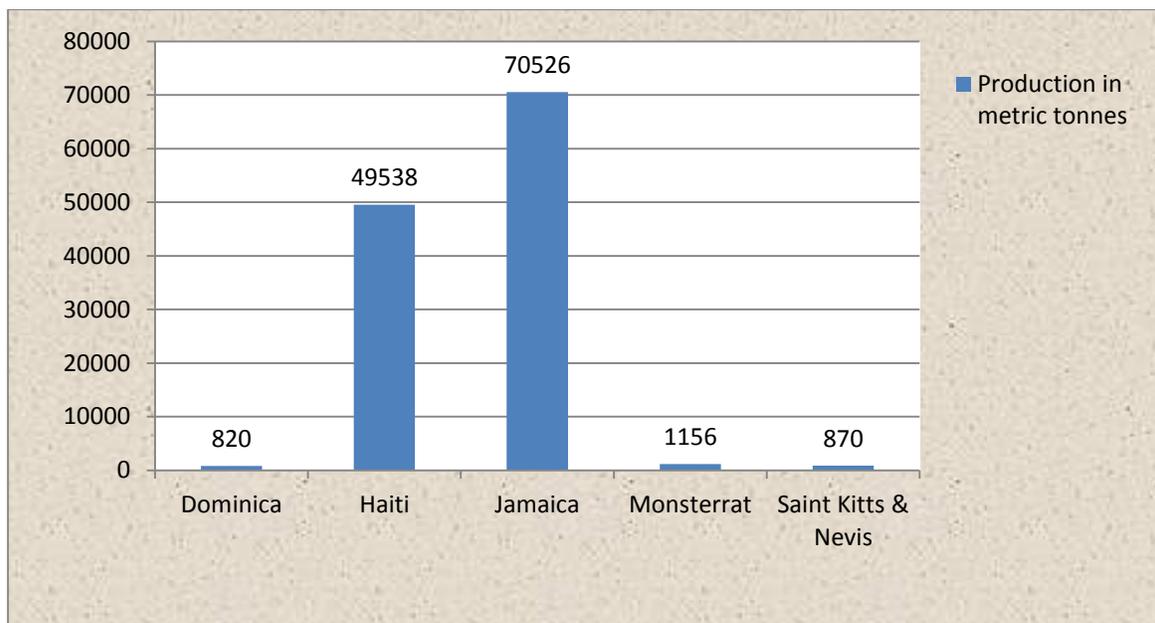
Irish potato is also grown in Haiti, Montserrat, St. Kitts and Nevis and in Dominica. During the period 2006-2011, Jamaica produced a total of 70,526 metric tonnes of Irish potato, which accounted for 57.43% of production in CARICOM countries, followed by Haiti which produced 49,038 metric tonnes, accounting for 40.34% of production. Less than 1% of the crop was produced in each of the other producing countries². **Figure 1** shows Irish potato production in CARICOM countries for the period 2006-2011.

In 2009, Haiti's production was 10,000 metric tonnes and, for the next two years, production levels declined. Conversely, Jamaica's production levels increased consistently from 2009-2011². Irish potato is an important staple food in Jamaica. In 2012, the Ministry of Agriculture estimated the monthly demand at 1,000,000 kg. The Government of Jamaica plans to make the country self-sufficient in Irish potato by 2015. **Table 1** shows production in the CARICOM countries for the period 2009-2011.

¹ I.E. Johnson, The Development of the Irish potato Industry in Jamaica, Division of Economics & Statistics, Ministry of Agriculture and Lands, Jamaica, V-85.

² Irish Potatoes Demand Schedule in the CARICOM Market for the Period 2009-2011, Agricultural Services Division, Ministry of Agriculture and Fisheries, pg. 2

Figure 1 Irish Potato Production in CARICOM Countries for the Period 2006-2011



Source: Irish Potatoes Demand Schedule in the CARICOM Market for the Period 2009-2011, Ministry of Agriculture and Fisheries, Jamaica.

Table 1 Irish Potato Production in CARICOM Countries for the Period 2009-2011

Country	Production (Metric Tonnes)		
	2009	2010	2011
Dominica	137	139	134
Haiti	10,000	7,679	7,090
Jamaica	8,708	11,222	15,333
Montserrat	210	213	205
St. Kitts and Nevis	200	73	162

Source: Irish Potatoes Demand Schedule in the CARICOM Market for the Period 2009-2011, Ministry of Agriculture and Fisheries, Jamaica.

Apart from Jamaica, among the CARICOM countries, Trinidad and Tobago is overwhelmingly the largest importer of Irish potato, followed by Barbados, St. Lucia and the Bahamas. Irish potato production, however, is virtually non-existent in these other

countries. **Table 2** shows Irish potato importation in CARICOM countries in 2009 and 2010.

Table 2 Irish Potato Importation in CARICOM Countries for the Period 2009-2010

Country	Irish Potato Importation (Tonnes)	
	2009	2010
Antigua and Barbuda	891	555
Bahamas	1,308	2,715
Barbados	8,644	8,619
Dominica	473	524
Grenada	1,290	1,055
Jamaica	8,967	5,125
St. Kitts and Nevis	376	418
Saint Lucia	1,324	1,467
Saint Vincent and the Grenadines	624	1,176
Trinidad and Tobago	43,763	21,358

Source: Irish Potatoes Demand Schedule in the CARICOM Market for the Period 2009-2011, Ministry of Agriculture and Fisheries, Jamaica.

2.0 Production and Production Regions

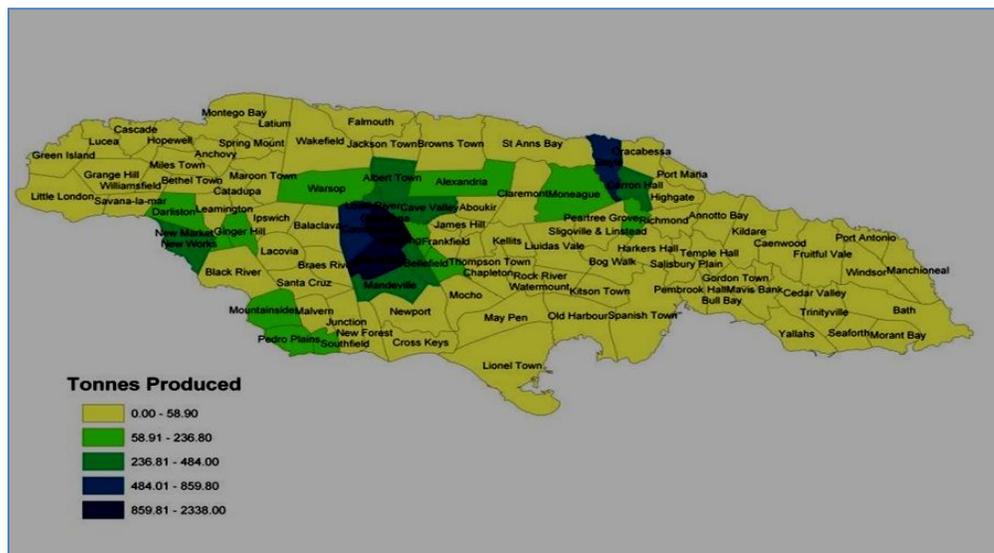
The climate, soil and rainfall in some areas in Jamaica constitute favourable conditions for Irish potato production. Irish potato thrives best in cool climate, about 10 inches of rainfall (well distributed during the crop cycle) and deep well drained soil³. While production is concentrated in the areas with bauxitic soils and elevation above 1000 ft., Irish potato is also grown in some flat areas during the cool season (November-February).

³ Irish potato Production in Jamaica – A Technical Guide, Ministry of Agriculture & Fisheries, Jamaica (2011)

Spunta (over 90%), Red Pontiac and Bellini are the three varieties of Irish potatoes currently produced in 8 parishes across Jamaica -- Clarendon, Trelawny (Albert Town to Christiana), St. Elizabeth (Hounslow), St. Andrew (Blue Mountain), Portland (Blue Mountain) St. Thomas (Blue Mountain and Johnson Mountain), Westmoreland (New market and Darliston) and Hanover.

The main production areas, however, are in the Guys Hill belt and in Christiana. The Guys Hill belt includes areas in St. Catherine, St. Ann and St. Mary in close proximity to Guys Hill. Geographically, the Guys Hill belt spans a significantly smaller production area than Christiana, however, the area is also responsible for about 40% of production, owing to higher concentration of activities in the cooler, mountainous region. Christiana accounts for about 55% of local production. **Figure 2** shows production areas in Jamaica. **Table 3** shows availability of Jamaican produced Irish Potato.

Figure 2 Irish Potato Production Areas in Jamaica and Levels of Production in 2011



Source: Ministry of Agriculture and Fisheries, Jamaica

Table 3 Availability of Jamaican Produced Irish Potato

Month	Availability at Farm Gate	Month	Availability at Farm Gate
January	Scarce - Fair	July	Fair - Good
February	Fair - Good	August	Fair
March	Good	September	Scarce
April	Good	October	Scarce
May	Abundant	November	Scarce
June	Abundant	December	Scarce

The local production contribution to consumption has increased steadily to meet demand. In 2007, local production contributed 34% to consumption, however, there was a drop in production in 2008 due to the passage of hurricanes which affected the agriculture sector. Thereafter, production consistently increased, contributing up to 70% of consumption in 2011. **Table 4** shows local production of Irish potato in Jamaica for the period 2007-2011 and contribution to consumption.

Table 4 Local Production of Irish potato in Jamaica for the Period 2007-2011 and Contribution to Consumption

	2007	2008	2009	2010	2011
Gross Production (Kg)	7,475,997	4,928,994	8,707,998	11,221,998	15,334,000
Marketable Production (Kg) (70% of gross production)	5,233,198	3,450,296	6,095,599	7,855,399	10,733,800
Consumption (Kg)	15,525,114	14,036,871	14,414,854	13,264,114	15,392,666
Local Contribution to Consumption	34%	25%	42%	59%	70%

Source: Ministry of Agriculture and Fisheries, Jamaica

The Government of Jamaica, through the Ministry of Agriculture & Fisheries and RADA, developed an Irish potato Production Plan for 2013-2015. The Government expects the country to be self-sufficient in Irish potato by 2015. For the period 2013-2014, 8 parishes were targeted for production, 3000 farmers for training in best practices, pest/pesticide management, post-harvest handling and marketing and 1250 hectares for production. In 2011, 856 hectares of land was projected for establishment for Irish potato production⁴. The 2013-2015 Plan, therefore, represents a targeted increase of 32% of land for production.

A key strategy proposed in the Irish potato production plan is to create a more even distribution of production throughout the year, maximizing year round favourable conditions in some areas. Increasing production during the second, third and early part of the fourth, however, will also require interventions to increase seed availability. **Table 5** shows proposed land to be established for Irish potato production in 2011 compared to 2013 target.

Table 5 Hectares Established for Irish Potato Production in 2011 Compared to 2013 Target

	Established 2011	Target 2013
January	84	84
February	40	150
March	30	150
April	0	0
May	0	0
June	0	60
July	17	60
August	15	60
September	20	60
October	140	60

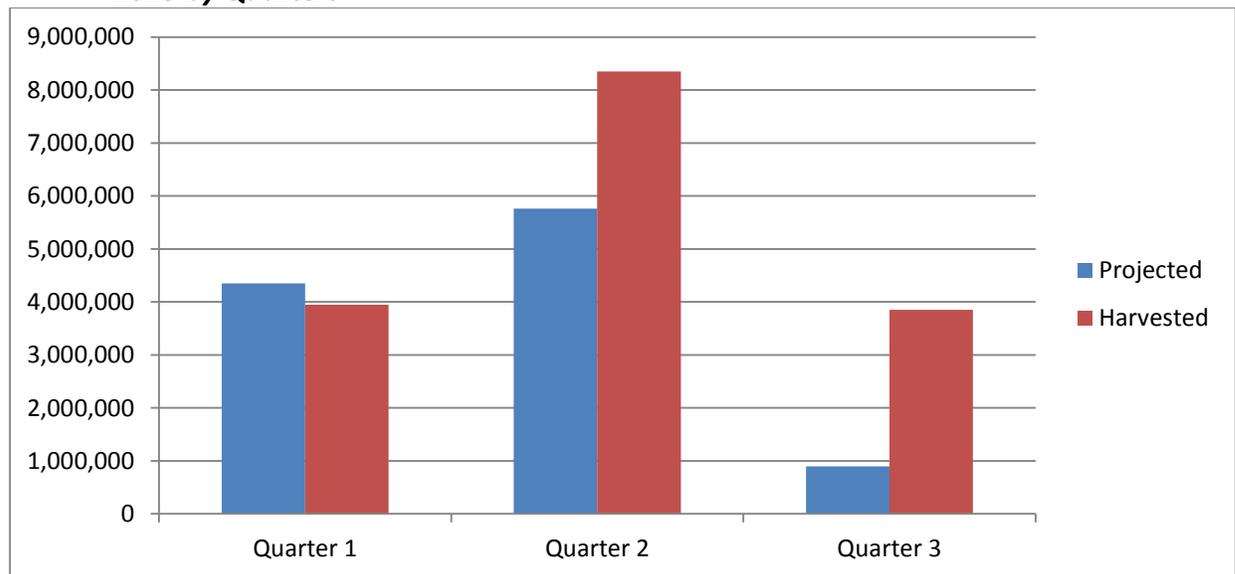
⁴ Irish potato Industry Plan for 2013, Agro Investment Corporation, Jamaica

November	270	150
December	240	80
Total	856	914

Source: Irish Potato Industry Plan for 2013, Agro Investment Corporation, Jamaica

Overall, Irish potato production increased for the first nine months in 2013. **Figure 3** shows comparison of projected and actual production for the first nine months in 2013 by quarters. The 2013 projection (13,710,000 Kg) also represents a slight decrease compared to the 2012 total production (15,396,000 Kg). The data indicates potential for significant establishment during the first quarter of the year, reflected in the availability of the produce during the second quarter. **Table 6** shows challenges encountered in production of the Irish potato in Jamaica and opportunities for PROPEL intervention.

Figure 3 Comparison of Projected and Actual Production for January to September, 2013 by Quarters



Source: Ministry of Agriculture and Fisheries, Jamaica

Table 6 Challenges in Production of Irish Potato in Jamaica and Opportunities for PROPEL

Challenges	Opportunities for PROPEL
<p>Erratic climatic conditions were responsible for the most severe problems and losses in the Irish potato industry in Jamaica. Although cooler, the peak planting season, (November to April) is also the low rainfall period in some areas in Jamaica, which is often also associated with drought conditions. Irish potato, however, requires moderate rainfall throughout the crop cycle. It is also expensive for small farmers to acquire irrigation systems.</p> <p>In other years, producers have also experienced between 70-80% loss of crops due to pest and diseases and rotting associated with high rainfall. During the high rainfall period it is also expensive to apply chemicals for treatment.</p>	<p>Producers can be facilitated to do risk analysis and develop mitigations strategies to reduce losses. For example, farmers can be facilitated to work with the Ministry of Agriculture and the meteorological office to review and document previous weather patterns and potential for specific conditions. Further assistance may be given to access resources or implement systems such as for irrigation, rain water harvesting, soil moisture retention and drainage. Protected agriculture technology has also been recognized as an effective measure that can be taken to protect crops from excessive rain, insects, etc. Crop insurance is also necessary to improve farmers' capacity to rehabilitate production after disasters.</p>
<p>Irish potato has delicate skin and requires care to avoid physical damage. The Ministry of Agriculture averaged about 15% post-harvest loss due to improper storage and physical damage. Many farmers are not adequately trained in post-harvest handling and do not have adequate facilities for storing and transporting produce. The Ministry of Agriculture intends to train 3,000 producers during 2013-2014. In 2013, 380 (13%) producers received training.</p>	<p>Capacity building is a common component of several projects targeting Irish potato and other producers in Jamaica. A collaborative approach can be taken to assess specific capabilities of targeted organizations and individuals, develop a capacity building plan and commence implementation by multiple active projects, including the Jamaica Social Investment Fund (JSIF), during the current production season (establishment) that will end in March, 2014. Applied training can contribute to increase marketable production in the current season. The next production season will commence in November, 2014.</p>
<p>Small holdings (land asset) and small scale production severely limit producers in accessing funds for working capital</p>	<p>The Bauxite industry in Jamaica is not very active and, therefore, lands are available for potato production. In November, 2013,</p>

<p>while the cost of production (inputs) is very high. Irish potato production is dominated by small farmers with average size holdings about 0.4 hectare (1 acre). In addition, these farmers are affected by land tenure issues. Over 85% of arable lands in Manchester, much of St. Ann (high Irish potato production areas) are also owned or controlled by the bauxite industry. Farmers are given short term lease - usually for 3 years and mined lands are not suitable for Irish potato production.</p>	<p>parliament recommended introducing the Security Interest in Personal Property (SIPP) Act legislation. The SIPP is aimed at improving access to domestic credit by allowing for non-traditional assets such as crops, intellectual property rights, and personal items to be recognized as collateral to secure loans. Producers, however, may need support and training in preparing documents for submission to funding institutions and in business management to support, sustain and develop the investments.</p>
<p>Emerging pests are affecting the Irish potato industry in Jamaica. Potato tuber moth affected producers from about 3 years ago and pink rot (<i>Phytophthora erythroseptica</i>) from about 4 yrs. ago. Pink rot is more severe in high soil temperatures followed by wet conditions before harvesting.</p>	<p>Research is ongoing to understand emerging diseases and pest management. Break through information needs to be disseminated to producers. In 2011, an Irish Potato manual was produced but not widely distributed. The Manual can be revised with updated information on pest and pest management. Media programmes can also be developed for regular dissemination of information.</p>

3.0 Producers Demographics

The Ministry of Agriculture estimates that about 3,000 famers produce Irish potato in Jamaica, down from over 17,000 producers in the 1970s and 1980s. Over 90% of producers have holdings about 0.4 hectare (1 acre), which characterizes them as small farmers. The farming population is male dominated and is generally aged above 50 years, however, over the past 5 years the industry has started to also attract young people, particularly in traditional farming areas and also young professionals. In October, 2013, through the Rural Agriculture Development Agency (RADA), the Ministry of Agriculture launched a programme, targeting youth (18-35 years) and women to become more involved in Irish Potato production in the Guys Hill belt (St. Catherine, St. Ann, St. Mary), Christiana belt (Manchester, Clarendon, St. Ann, Trelawny) and other selected areas (Westmoreland, St. James, St. Elizabeth) during the current season until February, 2014. Though Irish potato production is considered high risk, the produce gives high rate of

return on investment and is the primary earning activity for many producers and their households.

4.0 Planting and Harvesting Seasons

The planting and harvesting seasons vary in different areas in Jamaica. Typically, the planting season spans from November to March. Irish potato matures between 90-100 days (12-14 weeks) after planting and is harvested at that time. **Table 7** shows planting time for various areas in Jamaica. The staggered planting and harvesting schedule is beneficial to extend the availability period for the produce in the local markets.

Table 7 Planting Times for Irish Potato in Jamaica

Planting Date	Location
November-January	Spaldings, Kellits – <i>Clarendon</i> Cascade – <i>St. Ann</i>
December-January	Hounslow, Malvern, New Market- <i>St. Elizabeth</i> Carron Hall, Lucky Hill – <i>St. Mary</i>
November- December	Guys Hill – <i>St. Catherine</i> Bangor Ridge, Sherwood Forest - <i>Portland</i>
February - March	Devon, Christiana, Chudleigh, Spaulding – <i>Manchester</i> Cumberland - <i>Clarendon</i>
November-January	Darliston - <i>Westmoreland</i>
November- December	Wait-a-B, Lowe River, Lorrimers - <i>Trelawny</i>

Source: Irish Potato Production in Jamaica – A Technical Guide, Ministry of Agriculture & Fisheries, Jamaica (2011)

5.0 Seed Production and Sourcing

Cost and availability of seeds are major challenges for the Irish potato industry in Jamaica. Over 95% of seeds are imported from Holland and Canada. Generally, seed potatoes are

scarce during April–November when source countries are also planting potatoes from which seeds will be produced.

The Ministry of Agriculture encourages and issues permit for producers to purchase Basic, Super Elite or Elite seeds, i.e. third, fourth and fifth generation seeds. Older generation seeds carry much higher disease load, which significantly reduces yields. In 2012, 46,000 kg of seeds was purchased from Canada and 747,000 kg from Holland.

Table 8 Challenges in Irish Potato Seed Production and Sourcing in Jamaica and Opportunities for PROPEL

Challenges	Opportunities
<p>Availability of seeds and climatic conditions are the determinants for Irish potato production in Jamaica. Some areas, such as Manchester, are elevated above 2000 ft. and can, therefore, support Irish potato production (almost) throughout the year. Seed potatoes (imported and from the field), however, are scarce until about November through to March.</p> <p>The Christian Potato Growers Cooperative Association (CPGCA) is the only tissue culture lab in Jamaica concentrating on potatoes to produce planting materials, however, without massive cash injection the Association is currently only capable of producing materials to meet about 5% of the local seed demand.</p>	<p>CPGCA can increase seed production to meet about 25% of demand, especially targeting the period June–November when seeds are generally not available from the field and from outside sources. To increase seed production CPGCA needs to source micro tubers and/or mini tubers that are used to produce seeds. The Association has identified a Canadian company that it can negotiate with to supply the tubers between November 2013 and February, 2014 to produce seeds for planting from June to November, 2014. Christiana also has green houses in which the mini/micro tubers can be planted to produce seeds. The Association may need support/resources to pursue negotiations and to procure the materials.</p> <p>In the long term, Christiana aims to develop capacity to produce micro and mini tubers to produce seed potatoes.</p>

6.0 Yield and Attainable Yield

Approximately 42,385 Irish potato seed pieces are sown per hectare. Each seed piece produces 3-4 haulms (potato stem). Under rain-fed conditions, the targeted yield per hectare is 15,000 kg, however, yields ranged between 10,000-19,000 kg/hectare. Under optimal conditions, yield of 28,000 kg/hectare is achievable³.

7.0 Technology in the Industry

Technology for Irish potato production is generally limited to use of tractors for land clearing and preparation and mist blower to spray crops. Two potato seed planters are operated by private producers. Irish potato production is highly mechanized in the United States and in other developed countries. In Jamaica, manual labour increases the cost of production significantly. Notwithstanding, use of manual labour also facilitates social cohesion and increases the multiplier effect of the dollar. There may also be a direct correlation between high community involvement in production and lower incidences of praedial larceny.

8.0 Production Cost

The average size of holdings on which Irish potato is produced is 0.4 hectare. Production is driven by manual labour which represents the most expensive input. Materials are also costly. **Table 9** shows the cost of production that is applicable for 0.4 hectare of Irish potato production.

Table 9 Cost of Operations Model for Irish Potato Under Rain-fed Condition

COST OF OPERATIONS MODEL FOR IRISH POTATO UNDER RAIN-FED CONDITIONS				
	Cost Data Revised January 3, 2014			
	Model Size		BASE COST	
Acre	1			
Hectares	0.4			
ACTIVITIES	UNIT	No. of units	Unit cost	Total cost
Labour				
Clearing	Hectare	0.4	50,000.00	20,000.00
Ploughing	Hectare	0.4	12,500.00	5,000.00
Harrowing	Hectare	0.4	10,000.00	4,000.00
Bed shaping	Man Days	8	10,000.00	80,000.00
Organic matter application	Man Days	2	1,500.00	3,000.00
Applying fertilizer	Man Days	1	1,500.00	1,500.00
Planting	Man Days	10	1,500.00	15,000.00
Moulding	Man Days	5	1,500.00	7,500.00
Applying fungicide*	Man Days	8	2,000.00	16,000.00
Applying herbicide	Man Days	1	2,000.00	2,000.00
Harvesting	Man Days	22	1,500.00	33,000.00
Subtotal				187,000.00 44.4%
MATERIAL				
Seeds	25kg	20	4,000.00	80,000.00
Organic matter	Tonne	3	2,200.00	6,600.00
TSP	50kg	2	4,000.00	8,000.00
Foliar Fertilizer		1	5,000.00	5,000.00
Potassium nitrate	25kg	7	4,900.00	34,300.00
Fungicides				
Mankocide	Kg	2	1,200.00	2,400.00
Amistar	50 grams	6	1,500.00	9,000.00
Phyton	250 ml	1	1,750.00	1,750.00
Mancozeb	0.5kg	4	600.00	2,400.00
Ridomil	0.5kg	2	3,800.00	7,600.00
Insecticides				
Diazinon	250 ml	2	600.00	1,200.00
Pegasus	250 ml	1	4,100.00	4,100.00
Newmectin	250 ml	2	4,550.00	9,100.00
Herbicide				
Paraquat	gallon	1	3,300.00	3,300.00
Total Materials				174,750.00 41.5%
Other Costs				
Transportation - 5% of labour & material				18,087.50
Tools - 5 yrs amortized				2,400.00
Contingencies - 10% of labour & material				36,175.00
Land Charges (\$10,000/ha/yr)		1	2,500.00	2,500.00
Total Other Costs				59,162.50 14.1%
Total Material, Labour and other Costs				420,912.50 0.0%
INVESTMENT ACTIVITIES	UNIT	No. of units	Market Price	Total cost
Total cost				420,912.50 100.0%
YIELD	lbs	15000		
COST/kg				28.06
GROSS RETURN	lb.	43%	40.00	600,000.00
PROFIT				179,087.50

9.0 Marketable Production

The Ministry of Agriculture averaged about 70% of Irish potato production reached the local markets. About 15% of produce is lost through improper storage and poor handling of the produce between the field and market. About 15% of potatoes are also retained as seeds for subsequent production. **Table 4** above provides information about marketable production.

10.0 Domestic Markets and Consumption

Domestic markets are the only outlets for Jamaican produced Irish potato. Approximately 1.2 million Kg of Irish potato is consumed each month in the country. **Table 10** shows total and monthly consumption of Irish potato for the period 2007-2011. **Table 11** shows challenges in marketing Jamaican Irish potatoes and opportunities for PROPEL.

Table 10 Total and Monthly Consumption of Irish Potato in Jamaica in 2007-2011

	2007	2008	2009	2010	2011
Consumption	15,525,114	14,036,871	14,414,854	13,264,114	15,392,666
Monthly Average Consumption	1,293,759	1,169,739	1,201,238	1,105,343	1,282,722

Source: Ministry of Agriculture and Fisheries, Jamaica

Table 11 Challenges in Marketing Jamaican Irish Potato and Opportunities for PROPEL

Challenges	Opportunities
The current varieties of Irish potato produced for market in Jamaica has low starch content and is not suitable for fries, chips, potato wedges, baking and mash. The import bill for processed/prepared Irish potato is high as value addition is not a current major focus in the local industry. In 2011, Jamaica imported about 16.7 million Kg	Other lucrative markets exist in Jamaica, however, the industry does not have the productive capacity to access these markets. The Ministry of Agriculture and private sector commenced trials to diversify production, aimed at value addition and to meet demands of the untapped markets in the local food industry. Development of this new thrust

<p>of potato chips, 7.2 million Kg potato fries and over 46 thousand Kg of mashed potato in addition to about 4 million Kg of table potato.</p>	<p>in the industry will also require several follow up investments, including training and field support for producers, procurement of equipment and training for value addition (processing) activities, research and development, monitoring and evaluation and marketing services.</p> <p>The current varieties of Irish potatoes grown in Jamaica have health benefits and niche markets can be developed. For example, the low starch varieties can be promoted for use by diabetics and for making salads.</p>
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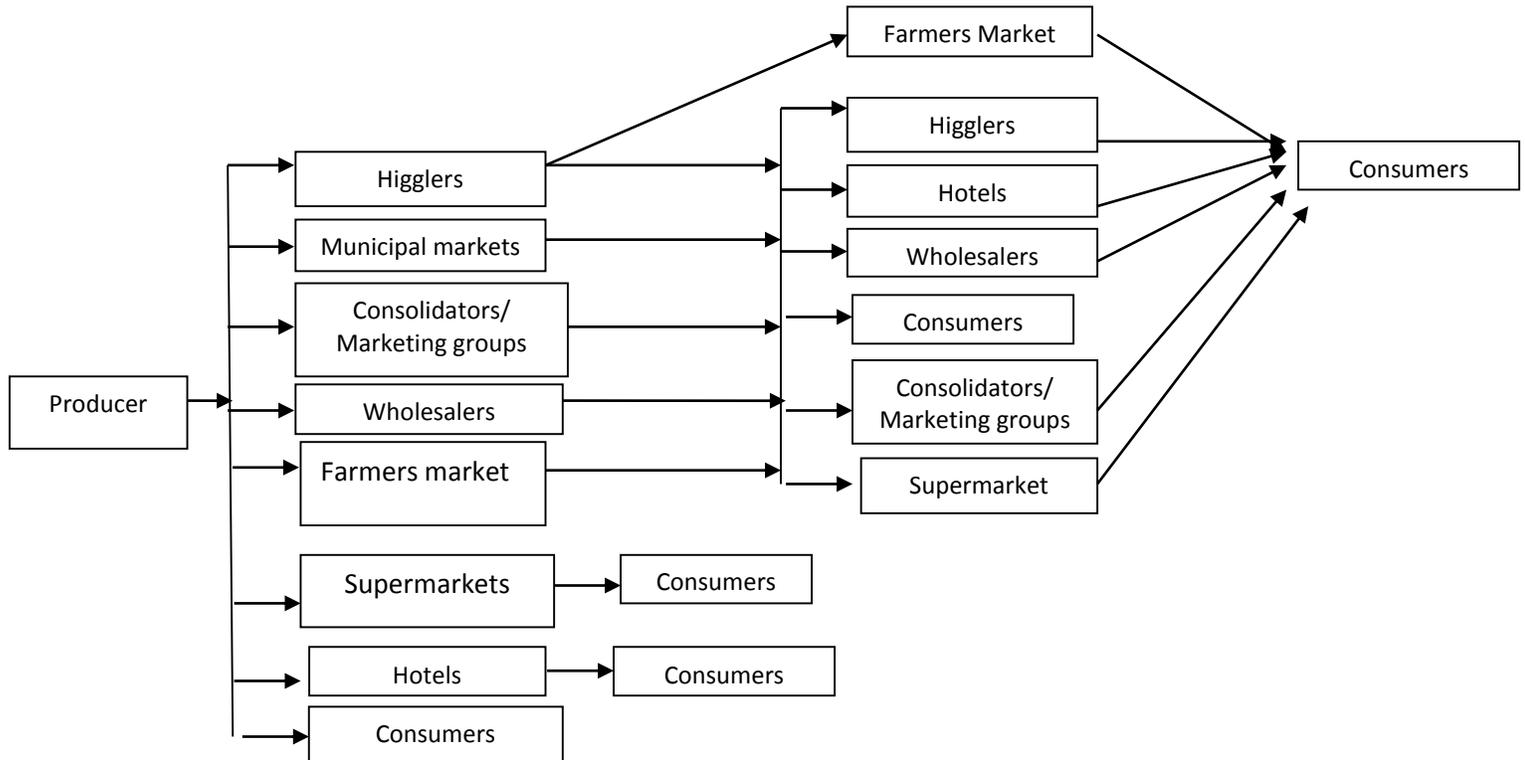
11.0 Distribution and Market Structure

The market structure for Irish potato is very complex and dynamic. Distribution channels include municipal markets, hotels, farmers' markets, wholesalers/consolidators and supermarkets. A.L. Golaub and Sons, Spanish Grain, Fresh and Direct, Glastonbury and CPGCA are the largest distributors of Irish potato in Jamaica. Over 25 other marketing groups and individuals are also involved in distribution of the produce. The Higglers trade is very significant is moving produce from the farm to consumer through a network of distribution points. Approximately 50% of Irish potato is sold to consumers through Coronation Market, which is a municipal market located in Kingston, 10% is sold through supermarkets and 10% through farmers markets. Hotels purchase about 30% of the produce. **Figure 4** shows the domestic market structure for Irish Potato in Jamaica.

Hotels also account for a significant portion of imported Irish potato each year. Up to 2012, hotels were granted import permits during periods when locally produced potatoes were scarce. Significantly larger volumes of Irish potato were purchased at cheaper prices from other countries. In 2008, 521,220 kg of locally produced Irish potato was purchased by hotels. During the same year, 1,303,050 kg of imported Irish potato was also purchased

by the hotels. Irish potato is highest on the list of the top 13 imported produce by hotels in Jamaica.

Figure 4 Domestic Market Structure for Irish Potato in Jamaica



12.0 Export Potential

Currently, Jamaica does not export Irish potato. As the major producing country in CARICOM, several regional organizations have expressed interest in purchasing Irish Potatoes from Jamaica. The Government of Jamaica intends to export about 12,000 tonnes of Irish potato to other CARICOM countries, in particular, Trinidad and Tobago, Barbados, St. Lucia and Antigua and Barbuda. St. Lucia Plant Quarantine has requested a pest risk analysis for potatoes and other crops from Jamaica. Burger King (Jamaica) is interested in supplying Irish potatoes and other produce from Jamaica to its Barbados, St.

Lucia and Trinidad outlets. Following regional buyer grower meetings, other marketing groups have also approached Jamaican distributors to purchase Irish potatoes.

13.0 Inventory Management and Pricing

The Ministry of Agriculture controls prices through a “release and store” system. When there is a glut in the market, prompting drop in prices, the Ministry encourages producers to store produce and reduce the volume in the market. About \$50 million was provided by the Government, through the Glut Management Fund, to contribute to storage of the produce.

Generally, local potatoes are sold at higher prices than imported potatoes. High cost and low scales of production critically limit producers’ capability to compete with the price of imported potatoes. Despite higher prices, the local produce is preferred by consumers for its freshness and esthetic appeal. **Table 12** shows local and imported Irish potato prices in municipal markets, retail markets and at farm gate in January, June and November, 2013. Market demands also influence price fluctuations across parishes. **Table 13** shows average price of Irish potato in parishes for the week ending 30 November, 2013.

Table 12 Irish Potato Prices at Three Points in January, June and November, 2013

Type	January, 2013				June, 2013				November, 2013			
Farm Gate Price (Per Kg)												
	Wk 1	Wk 2	Wk 3	Wk 4	Wk 1	Wk 2	Wk 3	Wk 4	Wk 1	Wk 2	Wk 3	Wk 4
Import	-	-	-	-	-	-	-	-	-	-	-	-
Local	127.9	132	139.7	154	104.5	108.9	104.5	99	194.3	214.5	176	189.8
Municipal Market Price (Per Kg)												
Import	-	-	-	-	-	-	-	-	-	-	-	-
Local	220	220	220	220	220	220	220	220	330	264	242	220
Retail Market Price (Per Kg)												
Import	253.0	233.6	247	247	-	-	-	-	296.3	291.5	283.7	283.7
Local	276.1	281.3	277.9	277.8	297	248.5	178.2	188.1	320.9	320.5	316.3	340.4

Source: Ministry of Agriculture and Fisheries, Jamaica

Table 13 Average Price for Local Irish Potato in Parishes in Jamaica for the Week Ending 30 November, 2013

Parish	Price (per Kg)	Parish	Price (per Kg)
Manchester	286	Hanover	242
Kingston and St. Andrew	289.67	St. James	198
St. Catherine	176	Trelawny	220
Clarendon	-	St. Ann	220
St. Elizabeth	330	St. Mary	-
Westmoreland	264	Portland	352
St. Thomas	352		

Source: Ministry of Agriculture and Fisheries, Jamaica

Higglers can secure significant discounts for large purchases at the farm gate and turn over the produce to consumers at much lower prices than in supermarkets and other markets. The Coronation market is a main distribution channel for the higglers and over 50% of produce is distributed in the market. Consumers overwhelmingly patronize the Coronation market and other municipal markets to purchase fresh produce at lower prices compared to other retail outlets. **Table 14** shows the average price for Irish potato at the farm gate, Coronation Market, and retail outlets in 2009-2012. **Table 15** shows challenges in inventory management and pricing Jamaica produced Irish potatoes and opportunities for PROPEL.

Table 14 Average Price for Irish Potato at the Farm Gate, Retail Outlets, Wholesale Outlets and Coronation Market in 2009-2012

Average Price per Kg				
	Farm Gate	Coronation Market	Other Municipal Markets	Retail Outlets (Supermarkets)
2009	101.31	131.50	121.65	193.45
2010	109.67	194.17	201.67	292.39
2011	141.96	141.17	-	312.81
2012	124.83	148.50	-	233.42

Source: Ministry of Agriculture and Fisheries, Jamaica

Table 15 Challenges in Inventory management and Pricing Jamaican Irish Potato and Opportunities for PROPEL

Challenges	Opportunities for PROPEL
Producers in Jamaica usually do not have appropriate facilities to stock inventory and are forced to sell their produce at discounted prices to consumers, wholesalers and consolidators.	There is need for appropriate financial systems to be established to support producers to access timely and fair payment for produce and credit for working capital.

14.0 Importation

Over the last 3 years, there has been a shift in the local production-import proportions as Jamaica moves towards self-sufficiency in Irish potato. About 80% of imported Irish Potato comes from the Netherlands and Canada to supplement shortfalls in local production. Smaller quantities are also imported from the United States and the Netherlands Antilles. By mid-December, 2013 3,085,000 Kg of Irish potato was imported from the Netherlands, 3,999,000 Kg from Canada, 233,000 from the Netherlands Antilles and 196,000 from the United States. Irish potato attracts a 40% CET. **Table 16** shows Irish potato importation for the period 2008-2013.

Table 16 Irish Potato Importation in Jamaica in 2008-2013

	2007	2008	2009	2010	2011	2012	2013 (January-Mid September)
Irish Potato Imports (Kg)	10,291,916	10,586,575	8,319,255	5,408,715	4,658,866	4,162,565	695,355

Source: Ministry of Agriculture and Fisheries, Jamaica

In 2007 and 2008, imports accounted for 58% and 68% of Jamaica Irish potato consumption, respectively. About \$400 million was spent for imports in 2008. In 2009, imports and local production were almost equal, however, in 2010, imports dropped to 33% and to 23% in 2011. Conversely, local production also increased in 2010 and in 2011 indicating displacement of imports. The import bill for Irish potato was reduced to less than \$300 million in 2010 and about \$182 million in 2011. The cost of processed Irish potato (chips, fries, wedges), however, cost the country about \$150 million in the same

year. In six years (2007-2012), Jamaica had the lowest imports of table potatoes in 2012, contributing 21% to consumption. For the first 9 months of 2013 compared to the same period in 2012, a 56% drop in imports was also realized. By mid-December, 2013 3,913,000 Kg of Irish potato was imported, suggesting that importation was significantly increased during the last quarter of the year.

Since 2012, the Government of Jamaica moved to reduce Irish potato importation by encouraging and providing incentives for private sector investment in the local sector. Import permits are given as “rewards” for investment when local produce is scarce. Several private entities have laid investments in local production, contributing to significant cuts in importation in 2012 and 2013.

15.0 Storage

Fuel cost is high in Jamaica, ranging between \$120-150/litre and also affects the cost of storage. Storage is estimated at about \$6.60 per Kg per month. CPGCA, Spanish Grain, Glastonbury and Fresh and Direct are the four largest groups that buy, store and distribute Irish potato into the local markets in Jamaica. Irish potato is stored at temperatures about 50 °F (10 °C). CPGCA has storage capacity for up to 1 million kg of Potato, Fresh and Direct (Harbour Cold Storage) up to 1 million kg, Glastonbury up to 300,000 kg and Spanish Grain up to 500,000 kg. Other smaller facilitates, cumulatively, can store about 500,000 kg. CPGCA submitted a plan to International Finance Cooperation (World Bank) for funding to upgrade the storage facility to store up to 3.4 million kg. The Ministry of Agriculture estimated the required storage for 2013 at 1.2-2.6 million kg/month during the peak season and 1 million kg/month in the low season. **Table 17** shows challenges in storing Irish potatoes in Jamaica and opportunities for PROPEL.

Table 17 Challenges in Storing Irish Potato in Jamaica and Opportunities for PROPEL

Challenges	Opportunities for PROPEL
<p>Irish potato can be held for about 10 weeks without cold storage, however, the produce must be kept in a well ventilated, cool, dark area. Most producers do not have adequate facilities to store Irish potato and, therefore, opt to sell the produce to cold storage facilities where the inventory can be held. Storage facilities are required to put up capital to pay producers and to hold the inventory until the produce is sold, normally within 3-6 months, thereafter. The cost of fuel for storage is high and significantly impacts the cost of the produce in the market.</p>	<p>Use of alternative energy for cold storage can contribute to significantly reduce operation cost, and ultimately, contribute to make the local produce price more competitive with that of the imported produce. Groups can be supported to access finance and or equipment for alternative energy in the medium or long term. There are local companies in Jamaica that can install systems that use solar, wind or a combination to generate energy.</p>

16.0 Transportation

Glastonbury and A.L Golaub use refrigerated trucks to transport Irish potato. Other major distributors do not have refrigerated trucks to transport the produce. To maintain the cold chain, potatoes should be transported in temperature about 10⁰C. Higher temperatures can result in condensation, predisposing the produce to spoilage.

17.0 Government Support for the Industry

The Government of Jamaica supports development of the local Irish potato industry through three main activities: restriction on imports, provision of inputs and promotion of local produce. Irish potato importation is restricted by the Government during local peak seasons. In addition, the Government has implemented an initiative that provides licenses for importation to private sector entities as a “reward” for investment in local production. Through its Irish Potato Sector Development Plan (2013-2015), the government is also providing inputs to support local production and facilitating access to financing through the Development Bank of Jamaica and the Peoples Cooperative Bank.

About \$30 million was spent by the Government for chemicals and other inputs for the 2013 crop and the amount is expected to be in 2014. A total of \$214,500 was allocated to benefit youth and women in Irish potato production in the 2013/2014 season. Through the Eat Jamaica campaign, consumers are also encouraged to buy locally produced fresh produce.

The Ministry of Agriculture, in collaboration with CPGCA, Grace Agro Grace and Glastonbury is also pursuing introduction of new varieties of seed potatoes (Sagitta, Innovator and Challenger were supplied by Agro Grace while others are expected from other suppliers) The new varieties have longer crop cycles (16 weeks) and starchier than the current varieties. These new varieties are expected to meet demands by agro processors and the fast food industry.

18.0 Other Institutional Support for the Industry

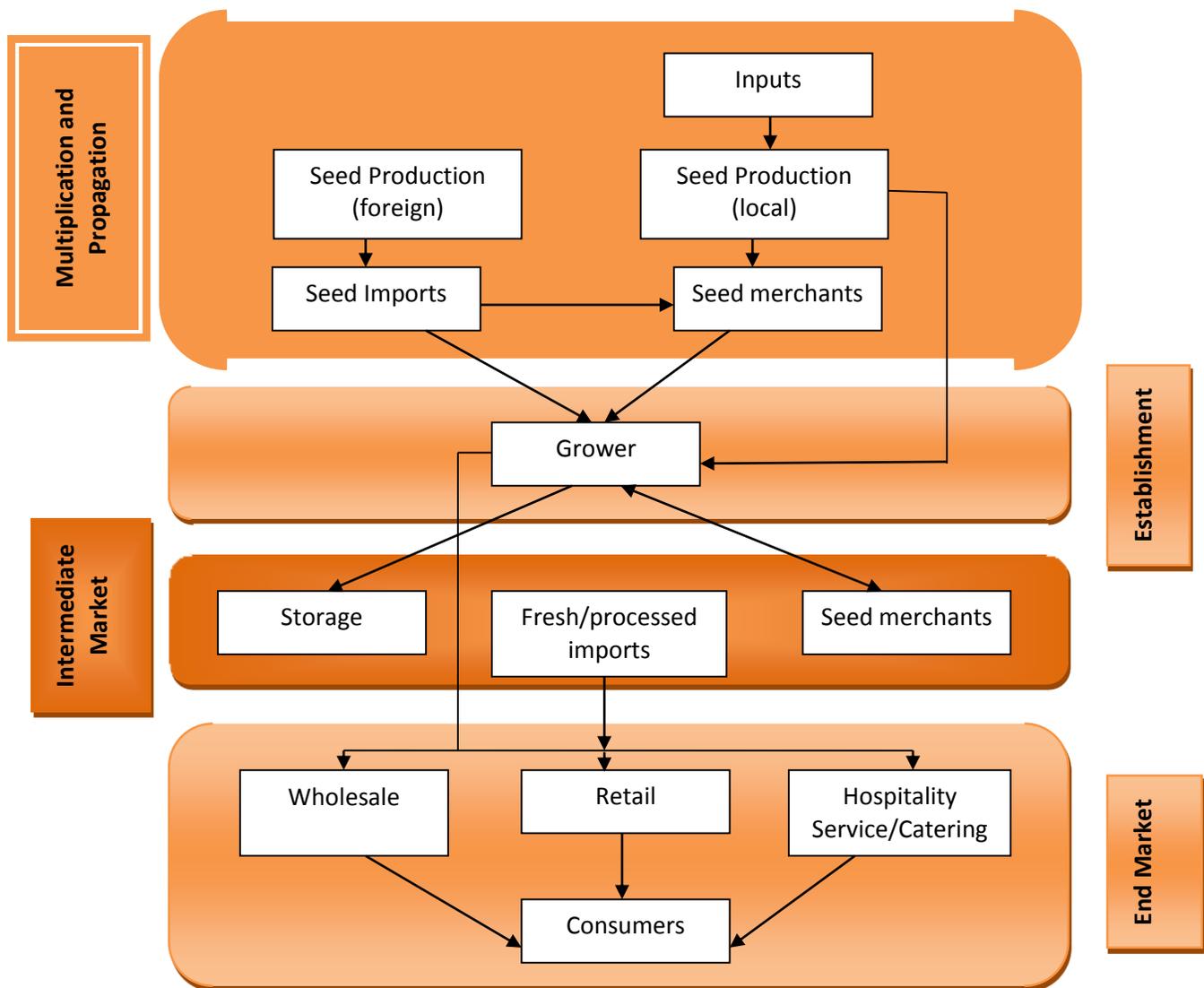
From 2013, Digicel Foundation has been providing support for the development of the seed potato industry. The Foundation has pledged US \$50,000 of which \$40,000 was already donated.

The Jamaica Social Investment fund, through the Rural Economic Development Initiative (REDI) has commissioned a study to assess in-vitro production of plants using temporary immersion technology with CPGCA, University of the West Indies (UWI), Scientific Research Council (SRC) and the Northern Caribbean University (NCU). A loan of US \$15 million was granted by the World Bank for various projects across Jamaica. Each target group is entitled to a maximum of US \$200,000.

19.0 Value Chain

The Jamaican Irish potato value chain is represented by complex, multi-directional relationships between actors at various levels: multiplication and propagation, establishment, intermediate markets and end markets. The Irish potato industry is lucrative and actors are involved in several activities to be competitive, and profitable. Regulations related to importation are the most significant in the industry. **Figure 5** shows the Irish potato value chain.

Figure 5 The Irish Potato Value Chain



20.0 Summary of Recommendations for PROPEL Interventions

Activity	Short/Medium Term	Long Term
Multiplication and Propagation	<p>Collaborate with Ministry of Agriculture to establish result demonstration plots for new variety trials for local chips and fries markets</p> <p>Support CPGCA in negotiations with Canadian organization and facilitate access to resources to procure mini tubers and micro tubers for seed potato production</p>	<p>Facilitate CPGCA to access funds to invest in alternative energy for lighting and cooling tissue culture laboratory used in seed potato production</p> <p>Support CPGCA in procurement of Temporal Emersion Equipment for reducing operational cost and increasing production of seed potatoes</p>
Establishment	<p>Facilitate training, technical support and access to resources for target groups to produce new varieties of Irish potato for chips and fries markets</p> <p>Update Irish potato Production Manual (2011) to include information on emerging pest and disease management</p> <p>Producers can be facilitated to do risk analysis and develop mitigations strategies to reduce losses associated with climatic conditions.</p>	<p>Facilitate producers to access credit for and purchase small land preparation equipment (tillers)</p> <p>Support the Ministry of Agriculture (Bodles) to do research on emerging pest and diseases resulting from climate change and other factors</p>
Storage and Marketing	<p>Identify and select producers and 4-6 consolidators to supply Irish potato to selected markets</p> <p>Support women and youth in processing new varieties of Irish potato for fries and chips markets</p>	<p>Facilitate establishment of a fund to advanced, fair payment to producers for sale of Irish and loans for working capital</p> <p>Facilitate distributors' access to finances to invest in alternative energy for storage facilities</p>
Transportation		<p>Facilitate consolidators' access to finances to procure refrigerated transportation</p>

Assess specific capabilities of targeted organizations and individuals, develop a capacity building plan and commence implementation by multiple active projects during the current production season (November- March, 2014)

Section 2 - The Ginger Industry

1.0 The Ginger Industry in Jamaica

The Government of Jamaica has selected ginger as a priority crop for development. Currently, Jamaica imports over 70% of ginger required for local consumption and exports about 10% of global market demands at twice world market prices. Jamaica grown ginger is recognized for its unique flavor and is in high demand in the domestic and international markets. Over the past 20 years, production was severely curtailed by rhizome rot. In 2012, however, the country was able to increase ginger production significantly. In addition to research on pest and diseases, the country is also building capacity to provide a sustainable supply of disease free planting materials every year.

2.0 Production and Production Regions

Ginger was introduced in Jamaica circa 1525 in the parish of St. Ann. From the early years the crop was produced for local consumption and for export. By 1547, the country's total export was about 1 million Kg. By the 1800s, the crop was produced in larger quantities in the Christiana area where soil and climatic conditions were more favourable⁵. Ginger grows well in elevations above 2,000 ft. and Clarendon, St Thomas, Trelawny, Portland, and St James are prolific production areas. During the 1950s, Jamaica was ranked as the third largest ginger producing country in the world. Production fell from about 2 million Kg in 1953 to about 0.4 million Kg in 1995. By 2008, the country ranked twenty third in production in the world with 298 tonnes per year⁵. Over the past 2 decades, the industry suffered major setbacks due to crop diseases, in particular, rhizome rot.

The Ministry of Agriculture intends to produce sufficient ginger over the next five years to meet demands. Following miserable performances in the industry in 2006, 2007 and 2008, production increased and stabilized in the subsequent three years. In 2012, production increased

⁵ Robert J. Lancashire, The Department of Chemistry, University of the West Indies, Mona Campus, Jamaica. Accessed on 19 December, 2013 at <http://wwwchem.uwimona.edu.jm/lectures/ginger.html>

significantly from 444 tonnes in 2011 to 1082 tonnes (143%). **Table 1** shows ginger crop harvested area and production in Jamaica in 2003-2012.

Table 1 Ginger Crop Harvested Area and Production in Jamaica in 2003-2012

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ginger crop area reaped (hectares)	133	145	152	133	145	152	107	105	106	149
Production (tonnes)	402	361	702	259	241	298	459	486	444	1082

Source: Ministry of Agriculture and Fisheries, Jamaica

The Ministry of Agriculture estimated about 2,400 acres of shade houses were required for production to meet global demands. Special assistance was given to farmers to produce ginger in agro parks and other areas at guaranteed prices and four greenhouses have been set up by the Ministry in Orange River, St Mary; Bodles, St Catherine; and Montpelier, St James to focus on hydroponic technology. **Table 2** shows challenges in ginger production in Jamaica and opportunities for PROPEL intervention.

Table 2 Challenges in Ginger Production in Jamaica and Opportunities for PROPEL

Challenges	Opportunities
Jamaica produced ginger is considered premium quality in local and international markets owing to its unique flavour. Owing to pest and disease infestations, many producers have abandoned the crop and, therefore, the local industry is unable to optimize opportunities in many lucrative markets. Severe and prolonged drought conditions have also negatively affected ginger yields during development phases where the crop is undergoing rhizome formation and development. Up to 2012, about 10% of export demand was met through local production.	Several initiatives are undertaken by the Ministry of Agriculture to improve ginger production in Jamaica. Owing to limited resources, the Ministry has and continues to seek collaboration with projects to provide adequate support for producers. Opportunities may exist for collaboration to provide training, technical (field) support and to facilitate access to resources to improve production capacity. For example, technical support and monitoring services are required in the process of adopting new/improved practices to cultivate ginger from materials produced in the tissue culture laboratory, however, the boodles research facility, does

	<p>not have adequate transportation and staff to provide service for all producers.</p> <p>Research is also needed to understand pest and disease management. The Bodles facility and the Scientific Research Council are focusing on production of disease free planting materials in soil-less media. Collaboration and resource sharing can contribute to facilitate the work of participating institutions.</p> <p>Ginger production manuals can also be produced to include information on land preparation, crop nutrition, crop establishment, pest management and harvesting and post harvesting management. Apart from mass distribution of manuals, other media can be used to disseminate information regularly.</p>
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3.0 Labour Force Demographics

The Ministry of Agriculture estimates that about 500 producers are involved in ginger production in Jamaica and about 90% produce on a small scale on about ½ to 1 hectare of land. Through a spice development programme, low skilled workers are employed by the Ministry of Agriculture to produce and process ginger and graduates of agricultural programmes provide extension services to producers. Women are mostly involved in preparing the ginger for domestic markets. Ginger production and processing are labour intensive and do not attract many young people.

4.0 Planting and Harvesting

Ginger is normally established after dormancy is broken by March through to June. Plantings after June do not develop enough foliage to produce big enough Rhizomes when short days begin and growth slows down. The crop is planted from small pieces of rhizomes known as sets. Commonly, producers retain planting materials from the previous crop, however, this method is not recommended as diseases can be transferred through infected planting materials. In 2012, CPGCA produced and distributed about 35,000 pieces of disease free planning materials and over

90 000 pieces in 2013 from its tissue culture laboratory while the Ministry of Agriculture distributed materials produced at the Scientific Research Council (SRC). The Ministry also intends to erect 100 shade houses to produce planting materials; 10 structures were erected in 2013 and 10 will be erected in 2014. Ginger rhizomes mature about 9 months after planting and are also harvested at that time. 0.4 hectare yields approximately 4,540 kg of ginger. **Table 3** shows challenges in planting and harvesting ginger in Jamaica and opportunities for PROPEL.

Table 3 Challenges in Planting and Harvesting Ginger in Jamaica and Opportunities for PROPEL

Challenges	Opportunities for PROPEL
<p>CPGCA, SRC, UWI, Bodles are producing local disease free planting material in Jamaica. Planting materials are mostly available during the months February to March and are normally planted up to the end of June. Those planted after June rarely produce enough rhizomes before December when the plants go into a dormant period for about 3 months until March to April of the next year.</p>	<p>CPGCA, the Export Division of the Ministry of Agriculture and Fisheries and other in vitro facilities can be facilitated to expand capacity to produce disease free planting material throughout the year using bio technology and protected agriculture. Current underutilized tomato and pepper houses can be used to produce ginger rhizomes.</p>
<p>Production is determined by availability of planting material and climatic conditions. In Jamaica, some areas have climatic conditions to facilitate ginger production throughout the year. Disease free planting material, however, can be very difficult and expensive to source.</p>	<p>CPGCA's capacity can be improved through reducing operation cost (utilizing solar or wind energy) and acquiring equipment to increase production and supply of disease free materials to producers in Jamaica. The Association has green houses in which the tissue culture produced plantlets can be grown to maturity in soilless disease free media from which farmers can access disease free planting material.</p>

5.0 Production Cost

The average size of holdings on which ginger is produced is ½ - 1 hectare. Production is mostly driven by manual labour which is expensive. Materials, however, represent the highest cost in production; 42%. **Table 4** shows the cost of production that is applicable for 0.4 hectare.

Table 4 Cost of Operations Model for Ginger Under Rain-fed Conditions

COST OF OPERATIONS MODEL FOR GRREN GINGER PRODUCTION UNDER RAIN-FED CONDITIONS				
Cost Data Revised December 27, 2013				
	Model Size		BASE COST	
Acre	1			
Hectares	0.4			
ACTIVITIES	UNIT	No. of units	Unit cost	Total cost
Labour				
Clearing	Hectare	0.4	35,000.00	14,000.00
Ploughing	Hectare	0.4	12,500.00	5,000.00
Harrowing	Hectare	0.4	10,000.00	4,000.00
Bed shaping	Man Days	30	1,500.00	45,000.00
Applying fertilizer	Man Days	4	1,500.00	6,000.00
Planting	Man Days	10	1,500.00	15,000.00
Moulding	Man Days	5	1,500.00	7,500.00
Applying fungicide*	Man Days	14	2,000.00	28,000.00
Applying herbicide	Man Days	7	2,000.00	14,000.00
Harvesting	Man Days	20	1,500.00	30,000.00
Subtotal				168,500.00
				33.8%
MATERIAL				
Sets	kg	909	100.00	90,900.00
Organic matter	Tonne	3	2,200.00	6,600.00
Foliar Fertilizer		3	5,000.00	15,000.00
Nutrition	50 kg	10	5,400.00	54,000.00
Fungicides				
Mankocide	Kg	2	1,200.00	2,400.00
Amistar	50 grams	6	1,500.00	9,000.00
Phyton	250 ml	1	1,800.00	1,800.00
Mancozeb	0.5kg	4	1,000.00	4,000.00
Ridomil	0.5kg	2	3,800.00	7,600.00
Insecticides				
Diazinon	250 ml	2	600.00	1,200.00
Pegasus	250 ml	1	4,100.00	4,100.00
Newmectin	250 ml	2	4,550.00	9,100.00
Herbicide				
Paraquat	gallon	1	3,300.00	3,300.00
Total Materials				209,000.00
				42.0%
Other Costs				
Transportation - 5% of labour & material				18,875.00
Supervision - 15% of labour & material				56,625.00
Contingencies - 10% of labour & material				37,750.00
Land Charges (\$10.000/ha/yr)		1	2,500.00	2,500.00
Total Other Costs				115,750.00
				23.2%
Total Material, Labour and other Costs				493,250.00
Irrigation Costs		5%		4,932.50
				1.0%
INVESTMENT ACTIVITIES				
Total cost	UNIT	No. of units	Market Price	Total cost
				498,182.50
				100.0%
YIELD	lbs	10000		
PRODUCTION COST/kg				49.82
GROSS RETURN	lb.	42%	70.65	706,500.00
PROFIT				208,317.50

6.0 Processing

Ginger processing includes washing and removal of dirt, slicing, drying and grinding. Dried ginger weighs about 1/5 of fresh ginger. Ginger is mostly sold green. P.A. Benjamin Manufacturing Company and Caribbean Teas Limited purchase large volumes of ginger from local producers for drying and grinding for export to the UK, Germany and Japan and to produce teas. The Export Division in the Ministry of Agriculture purchases a smaller volume of fresh ginger for processing and sale to the US, Japan and Canada. Ginger processing has the potential to create employment, particularly for women. **Table 5** shows challenges in processing ginger in Jamaica and opportunities for PROPEL.

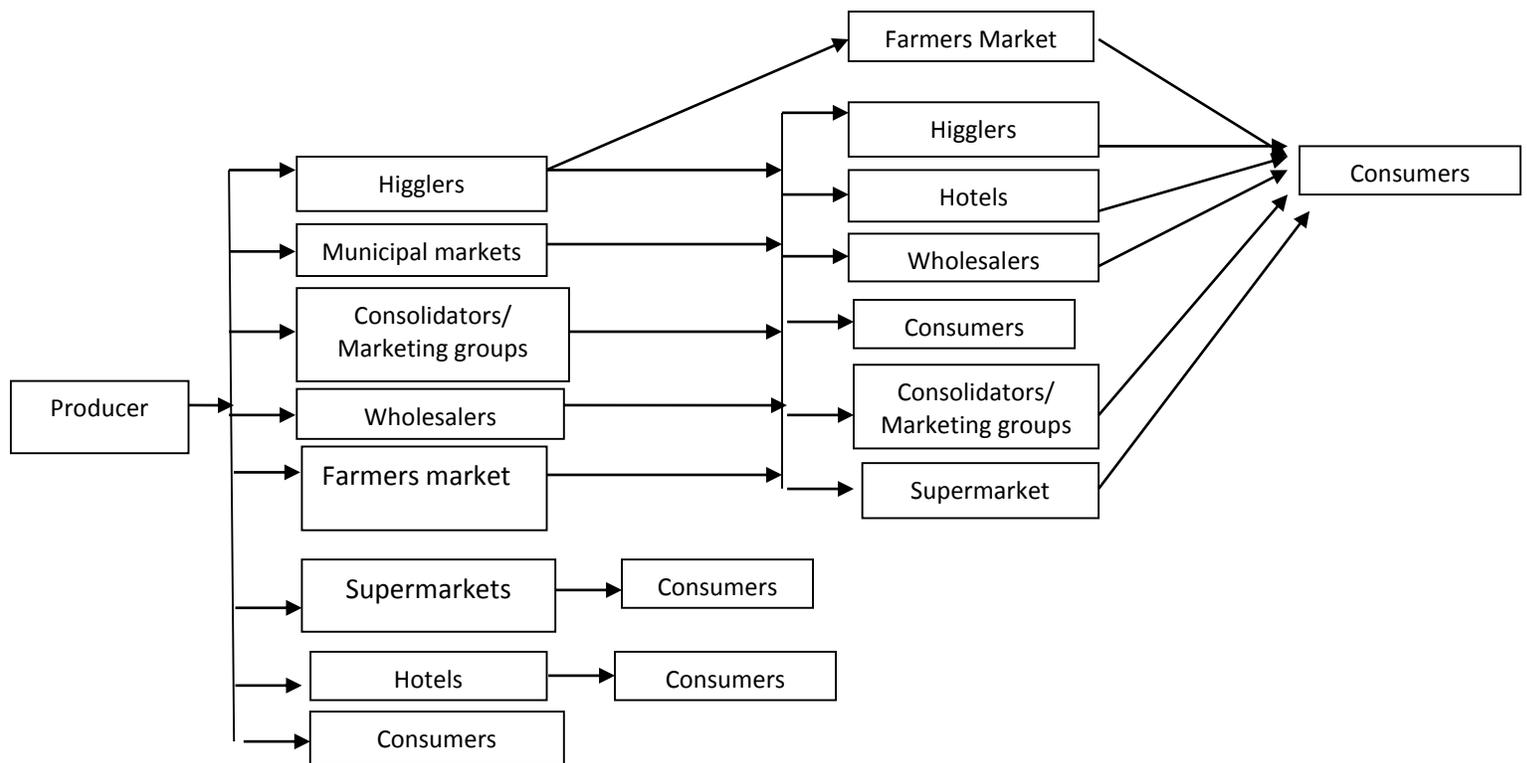
Table 5 Challenges in Processing Ginger in Jamaica and Opportunities for PROPEL

Challenges	Opportunities for PROPEL
<p>Jamaican ginger pulp/powder and oil are in high demand by drinks and confectionery industries. Ginger processing, however, is very time consuming when done manually and equipment can be costly. Three main business entities process and export ginger. Local producers, therefore, are unable to benefit, meaningfully, from value addition. Cost is also incurred to transport produce to centralized processing facilities.</p>	<p>Ginger oil production is emerging in Jamaica and initiatives are undertaken to develop other local value added industries, such as ginger tea, condiments and confectioneries. Decentralized processing may be a key strategy to develop the ginger agro processing industry. Targeted groups (community, gender, age) can be supported to access funds for small solar dryers and ginger oil extractors and training provided to process ginger to maintain the oleo resin content associated with the unique flavor. Women may be specially targeted for processing ventures.</p>
<p>Oleo resins are found in highest volumes in green ginger and give the fresh produce its unique flavour. Oleo resins are sensitive and decreases over time and in dried ginger. Unavailability of green/fresh ginger can also have impact on the character of processed products in which the dried ginger is used.</p>	<p>There is need to increase storage facilities for fresh ginger, and thereby, increase availability of the produce throughout the year in a state when it has the highest volume of oleo resin that is responsible for the unique flavor.</p>

7.0 Domestic Markets and Consumption

Seventy percent (70%) of locally produced ginger is consumed in Jamaica each year. Ginger is utilized in local drinks, seasoning and confectionery. About 90% of ginger is sold green (fresh), 8% is dried and 2% is grounded to powder. Municipal markets account for about over 50% of distribution to consumers of which Coronation market accounts for about 80%. A small amount of ginger is traded through supermarkets/retail outlets and hotels and hospitality institutions. **Figure 1** shows domestic market structure for Jamaican ginger trade.

Figure 1 Domestic Market Structure for Ginger in Jamaica



8.0 Export Markets

Jamaica exports ginger to the United States, Canada, Barbados, Germany and Japan and the United Kingdom. P.A. Benjamin Manufacturing Company, Caribbean Teas Limited and the Export

Division are the main traders for fresh and processed ginger (teas, powder) for export markets. The Ministry of Agriculture Export Division estimates global demand at 21,000 metric tonnes, valued at \$3 billion. Current local production meets about 10% of export demand. **Table 6** shows challenges for Jamaican ginger to access export markets and opportunities for PROPEL.

Table 6 Challenges for Jamaican Ginger to Access Export Markets and Opportunities for PROPEL

Challenges	Opportunities
<p>In 2013, Chris Reed, founder and CEO of REEDS, a US based company that produces ginger beer, dubbed Jamaican style-, disclosed that the company is willing to buy 100 Jamaican ginger if available and the price is competitive. The company earned about US \$17 million in the first nine months in 2013. Jamaica started supplying the company within the last 2 years, however, supplies have been inconsistent. The company requires a consistent supplier of ginger pulp without fiber⁶.</p>	<p>Marketing and distribution entities can be supported in negotiations to access lucrative domestic and international markets while production increases to meet demands. Global GAP certification issues also need to be addressed to facilitate access to some international markets. For example, the Ministry of Agriculture is aware of market interest in the United Kingdom and other countries, however, producers are required to be Global GAP certified to supply the markets. JSIF and the World Bank have interest in partnering with other regional projects to certifying producers in Global GAP to access international markets.</p>
<p>Despite Jamaica’s advantage of producing premium quality ginger, some local ginger products are considered at lower quality than imported ginger products. For example, Kendel ginger tea bags are imported from Thailand into Jamaica and are reported to taste better than the Jamaican brands. Proper processing of the oleo resins is important to maintain the flavor in ginger.</p>	<p>Training is needed for proper processing of oleo resin to maintain flavor food and drinks.</p>

⁶ http://www.jamaicaobserver.com/business/US-drink-maker-bemoans-low-Jamaican-ginger-supply_15670354

9.0 Pricing

Owing to its premium quality, dried Jamaican ginger earns about \$770 per Kg (US \$7.70) in international markets. Prices have also increased consistently at the farm gate and in the domestic markets. During the first nine months of the year, local ginger prices are generally competitive with imported ginger. In the local markets, fresh ginger prices can increase 6 fold during September to December when the produce is scarce. The price of ginger fluctuates across parishes based on demand. **Table 7** shows average price for local ginger at the farm gate in Jamaica in 2003-2012. **Figure 2** reflects the trend in ginger prices at the farm gate in Jamaica for the same period. **Table 8** shows prices for ginger in Jamaica at the farm gate, municipal markets and retail markets in January, June and November, 2013. **Table 9** shows the average price for ginger in various parishes.

Table 7 Average Price for Local Ginger in at Farm Gate in Jamaica in 2003-2012

Year	Ginger Price Per Kg
2003	86.41
2004	94.6
2005	105.93
2006	102.4
2007	126.38
2008	127.24
2009	123
2010	135.48
2011	145.98
2012	155.45

Source: Jamaica Ministry of Agriculture and Fisheries

Figure 2 Rise in Ginger Prices at the farm Gate in Jamaica

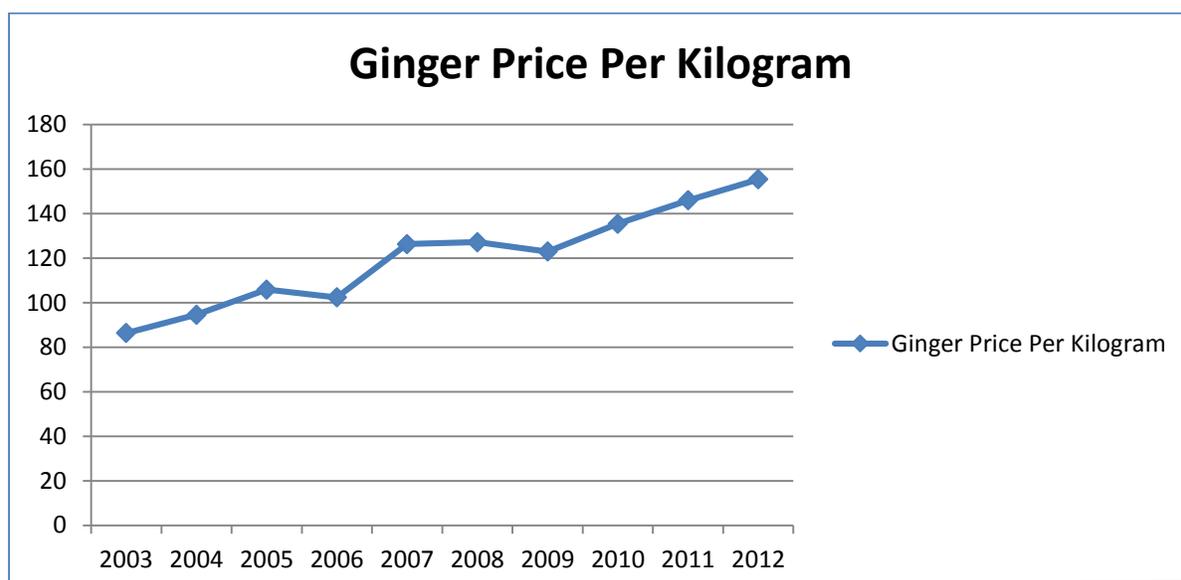


Table 8 Ginger Prices at Three Points in Jamaica in January, June and November, 2013

Type	January, 2013				June, 2013				November, 2013			
Farm Gate Price (Per Kg)												
	Wk 1	Wk 2	Wk 3	Wk 4	Wk 1	Wk 2	Wk 3	Wk 4	Wk 1	Wk 2	Wk 3	Wk 4
Import	-	-	-	-	-	-	-	-	-	-	-	-
Local	220	181.5	209	132	264	330	330	285.1	275	227.9	220	220
Municipal Market Price (Per Kg)												
Import	-	-	-	-	-	-	-	-	-	-	-	-
Local	330	341	330	330	385	440	440	440	385	330	330	385
Retail Markets (Per Kg)												
Import	580	564.2	510.9	577.6	675.2	641.7	696.6	705	798.7	1001.8	1108.3	1124.6
Local	548.7	382.8	512.1	510.9	590.5	594	669.8	656.7	573.6	465	465	465

Source: Jamaica Ministry of Agriculture and Fisheries

Table 9 Average Price of Ginger in Various Parishes in Jamaica in November, 2013

Parish	Price (per Kg)	Parish	Price (per Kg)
Manchester	242	Hanover	330
Kingston and St. Andrew	359.33	St. James	220
St. Catherine	220	Trelawny	220
Clarendon	293.33	St. Ann	330
St. Elizabeth	330	St. Mary	440
Westmoreland	330	Portland	440
St. Thomas	365.20		

Source: Jamaica Ministry of Agriculture and Fisheries

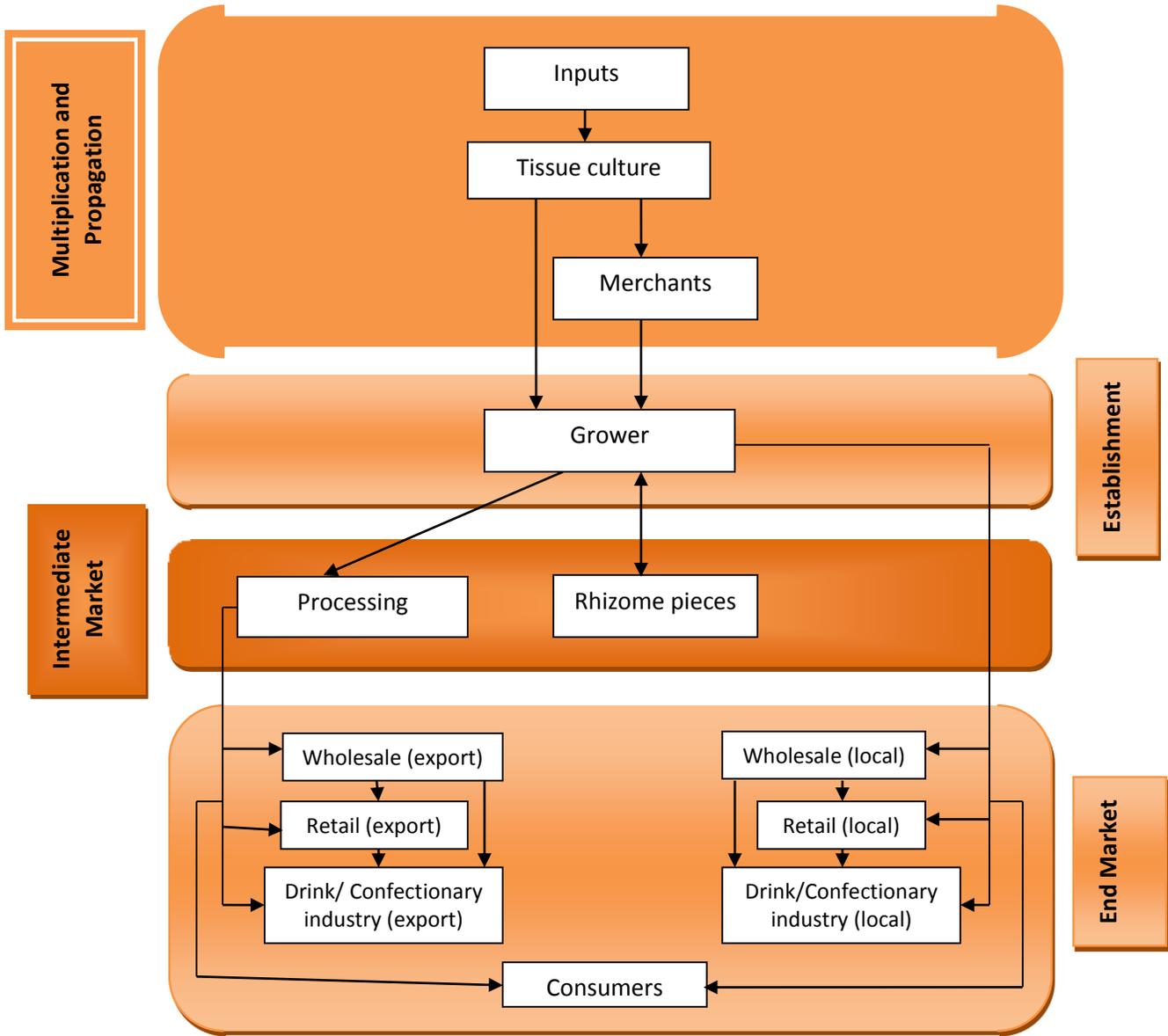
10.0 Institutional Support for the Industry

Government institutions, such as the SRC and Bodles Research Station, are collaborating with other organizations, such as UWI, CPGCA and Caribbean Agriculture Research and Development Institute (CARDI) and NCU, to rehabilitate the ginger industry through research and training and production of disease free planting materials. The Government's Production and Productivity Programme objectives are to provide disease free planting materials, expand cultivated acreage, increase yields and guarantee markets at competitive price. In 2013, the government committed \$120 million for ginger production. The Jamaica Social Investment Fund, through the Rural Economic Development Initiative (REDI) is also focusing on expansion of ginger production, training and markets.

11.0 The Ginger Value Chain

The Jamaican ginger industry is relatively simple and has potential for development at all levels. Over the past 5 years, the industry has made great strides in resolving challenges related to multiplication/propagation. Production (establishment) remains a major hindrance to market access. Training and resources are also needed to develop the intermediate and end markets. **Figure 3** shows the value chain for Jamaican ginger.

Figure 3 The Ginger Value Chain



12.0 Recommendations for PROPEL Interventions

Activity	Short/Medium Term	Long Term
Multiplication and Propagation	Facilitate CPGCA, Export Division and other in vitro facilities to access resources and equipment to increase production of disease free planting materials	Facilitate CPGCA to access funds to invest in alternative energy for lighting and cooling tissue culture laboratory to reduce operation cost and ultimate cost of materials
Establishment	Collaborate with Ministry of Agriculture to establish/increase production in shade houses to protect ginger crop from pest and diseases	Facilitate producers to access credit for and purchase small land preparation equipment (tillers)
	Produce and distribute a Ginger Production Manual	Collaborate with the Ministry of Agriculture (Bodles) to do research, development and provide extension services for ginger production
	Facilitate training, technical (field) support and access to resources for producers to improve and increase production	
Processing	Facilitate access to funds and equipment (solar dryers, oil extractor etc.) to set up community based ginger processing facilities	Facilitate training in processing Jamaican ginger to preserve flavor in food and drinks
	Facilitate women's access to resources and training in ginger processing at the community level	Facilitate technology development for value addition for ginger
Storage and Marketing	Collaborate with JSIF and the World Bank to certify ginger producers in Global GAP to access international markets	Facilitate access to funds and equipment for storage of green ginger that can be released throughout the year, thereby, and increasing available of the produce throughout the year in its green state with the highest volumes of oleo resins which is responsible for unique flavour
	Support marketing groups to access lucrative domestic and international markets	

Section 3 – The Yam Industry

1.0 Performance of the Industry in a Decade, 2003-2012

Yams are the most important staple crop in Jamaica and the industry has been a thriving one for many years. Yams are produced primarily for the local market, however, about 30% is also exported each year. In 2003, almost 90,000 Kg of yams was produced in Jamaica. Production decreased by 10% in 2004, mainly due to tropical storm activity that occurred in the same year. Production levels stabilized from 2009 to 2011 and peaked in 2012, when production surpassed 100,000 Kg and increased by 12% when compared to the 2011 production year. In 2012, the yam industry contributed approximately 21% to the total gross agricultural production⁷.

2.0 Production and Production Areas

Yam production, and particularly yellow yam, is a priority for the Government of Jamaica. A very small yam processing sub-sector also exists in Jamaica. Over seven varieties of yams are grown in Jamaica, however Negro yam, producing 10%, Lucea 8% and Renta 5% are the most common varieties produced in the country⁸. **Table 1** shows yam production in Jamaica for the period 2003-2011. Yellow yam is preferred in domestic and export markets and represents 65% of yam production in Jamaica. **Table 2** shows production area in Jamaica for yellow yam in 2012. Yams are produced throughout Jamaica, however, the main producing regions are in the Middlesex County, Trelawny, Clarendon, Manchester, St. Elizabeth and St. Ann. Trelawny produces over 60 % of the yams in Jamaica.

⁷ Ministry of Agriculture and Fisheries

⁸ Govind Seepersad. Analysis of the Jamaican Fresh Produce Industry Supply Analysis,

Table 1 Yam Production in Jamaica for the Period 2003-2011(Tonne)

	Lucea	Negro	Renta	St. Vincent Yam	Sweet Yam	Tau Yams	Yellow Yams	Other Yams	Total
2002	16157	14163	10909	4428	13487	3614	83153	2241	148152
2003	15021	14947	11200	4489	13535	3672	86831	2543	152238
2004	12896	12152	11380	3524	11760	3478	78887	2090	136167
2005	10241	11633	6444	2243	6313	2696	66243	1482	107295
2006	9831	12654	7956	2717	6275	2913	78571	2088	123005
2007	10306	11217	8006	2323	5186	2588	71863	1636	113124
2008	10542	11075	6662	2026	3765	2150	64374	1689	102284
2009	9609	15289	8253	2443	4411	2245	80531	1735	124516
2010	10744	15163	9444	2902	3907	2442	89944	2240	136785
2011	9138	16311	9892	2801	3291	2507	88601	2079	134620

Source: Ministry of Agriculture and Fisheries, Jamaica

Table 2 Production Area for Yellow Yam in Jamaica in 2012

Year	Production Area
2002	5167
2003	4941
2004	4423
2005	4671
2006	4559
2007	4245
2008	4838
2009	5359
2010	5659
2011	5800

Source: Ministry of Agriculture and Fisheries, Jamaica

3.0 Planting and Harvesting

Planting and harvesting varies in different locations in Jamaica. Though the crop is produced all year round, the main planting season is from February to April, with the most harvesting taking place between December and March.

Yellow yams are traditionally replanted by using “heads” that remain after cutting the parts used for marketing. These are normally left until sprouting begins and then replanted. Mini-setts are done by dividing selected pieces of yams into two ounce bits that are allowed to sprout under moist medium such as coir. The technology was introduced to Jamaica about 1985. Miniset yams have advantages in production (does not have toes), marketing (smaller and regular shaped), storage (less water loss) and packaging (does not require cutting of the head before shipping).

Experiments are being carried out, spearheaded by the Ministry of Agriculture and the Agro Investment Corporation, to grow yams under irrigation, (less than 1% of yams are grown under irrigation). This could have significant impact on minisett production, prevent the extinction of sweet yams and other soft yam varieties and improved yam quality for the export market. Yams mature between 240 to 300 days (8-10 months) after planting and are harvested at that time. Materials represent the highest cost in yam production. **Table 3** shows the cost of production for yams. **Table 4** shows challenges in yam production in Jamaica and opportunities for PROPEL.

Table 3 Cost of Yam Production in Jamaica

COST OF OPERATIONS MODEL FOR YELLOW PRODUCTION IRRIGATED CONDITIONS				
Cost Data Revised December 27, 2013				
	Model Size		BASE COST	
Acre	1			
Hectares	0.4			
ACTIVITIES	UNIT	No. of units	Unit cost	Total cost
Labour				
Clearing	Hectare	0.4	35,000.00	14,000.00
Ploughing	Hectare	0.4	12,500.00	5,000.00
Harrowing	Hectare	0.4	10,000.00	4,000.00
Furrowing	Hectare	0.4	10,000.00	4,000.00
Planting	Man Days	5	1,500.00	7,500.00
Stake, Tie, Twine	Man Days	20	1,500.00	30,000.00
Herbicide	Man Days	3	1,500.00	4,500.00
Weed Control	Man Days	8	1,500.00	12,000.00
Applying fungicide and Insecticide	Man Days	3	2,000.00	6,000.00
Harvesting	Man Days	25	1,500.00	37,500.00
Subtotal				124,500.00
				26.5%
MATERIAL				
Heads	kgs	925	160.00	148,000.00
Foliar Fertilizer		3	5,000.00	15,000.00
Nutrition		10	5,200.00	52,000.00
Fungicides				
Phyton	250 ml	1	1,800.00	1,800.00
Mancozeb	0.5kg	4	1,000.00	4,000.00
Ridomil	0.5kg	1	3,800.00	3,800.00
Insecticides				
Diazinon	250 ml	5	600.00	3,000.00
Herbicide				
Paraquat	gallon	1	3,300.00	3,300.00
Total Materials				230,900.00
				49.2%
Other Costs				
Transportation - 5% of labour & material				17,770.00
Supervision - 15% of labour & material				53,310.00
Contingencies - 10% of labour & material				35,540.00
Land Charges (\$10.000/ha/yr)		1	2,500.00	2,500.00
Total Other Costs				109,120.00
				23.3%
Total Material, Labour and other Costs				464,520.00
Irrigation Costs		5%		4,645.20
				1.0%
INVESTMENT ACTIVITIES				
Total cost				469,165.20
				100.0%
YIELD	lbs	16000		
PRODUCTION COST/kg				29.32
GROSS RETURN	lb.	56%	45.60	729,600.00
PROFIT				260,434.80

Table 4 Challenges in Producing Yam in Jamaica and Opportunities for PROPEL

Challenges	Opportunities
Many producers reuse yam heads for planting, which are sometimes infested by nematodes.	Existing tissue culture facilities can be supported to produce/expand production of disease free planting materials. Miniset yam tubers can also be developed in tissue culture labs for planting. Miniset yams are preferred for export markets.
The presence of high levels of Cadmium in some major production areas (bauxitic soil area) such as in Manchester. Cadmium is known to be dangerous in the food chain. The university of the International Center for Environmental and Nuclear Sciences (ICENS) in collaboration with the UWI and the MOA and other institutions are conducting research to understand risk associated with high levels of cadmium in production areas in Jamaica. The abstract of a paper published in 2005 is contained at http://www.ncbi.nlm.nih.gov/pubmed/	Soil testing is important in countries where cadmium and other pollutants are present above recommended levels. Soil testing services are usually costly and difficult to access and, therefore, may producers require financial and/or other support for the services. Soil analysis kits may also be purchased for groups to provide services for members and other producers (at cost).
Deforestation owing to producers cutting stakes to support yam vines.	Result demonstration plots can be established to show benefits of using alternative yam staking methods to cutting trees.

4.0 Technology in the Industry

Technology is virtually absent in production of yams in traditional growing areas. Modest technology is, however, used in non-traditional areas (agro-parks); tractors for land clearing and preparation, irrigation, fertigation and mist blowers to apply chemicals. Yam production practices are best understood among all other produce in Jamaica. The industry can be further advance through use of technology to develop miniset and tissue culture.

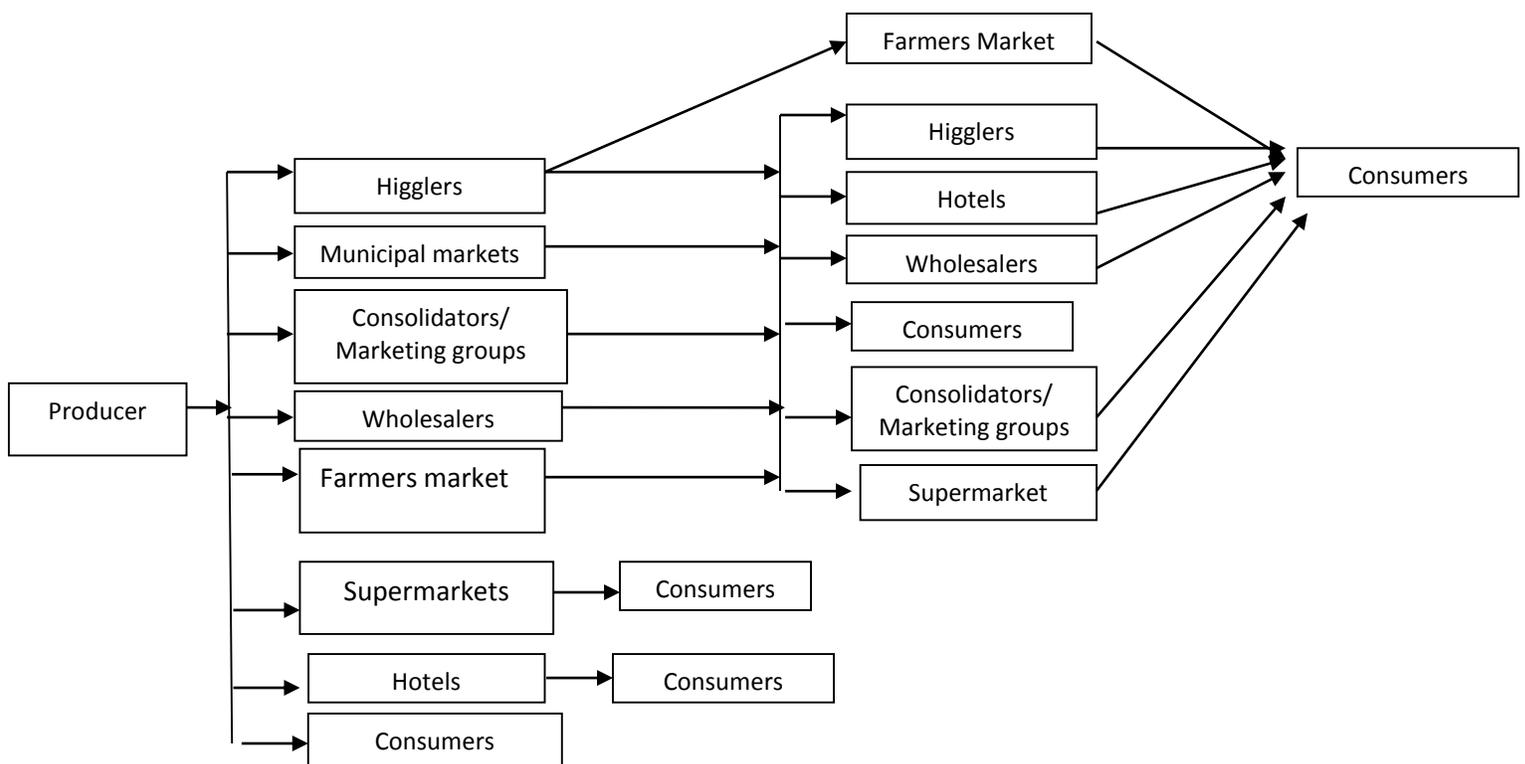
5.0 Domestic Markets and Consumption

Domestic markets are the main outlets for Jamaica yams. Yellow yams are preferred and sale has remained stable over the past ten years as the produce remains a vital part of the Jamaican

diet. Approximately 70% of yams produced in Jamaica are consumed locally. Yellow yams are preferred in the domestic markets and high production volume lends to availability year round. The municipal markets are the main distribution channels. Overall, about 70% of yams are traded through municipal markets of which 50-60% are traded in the Coronation Market. Small amounts of yams are traded in supermarkets, however, the volume of sale is increasing. Hotels also use a very small amount of yam. Higglers account for a significant volume of trade, both in domestic and export markets. **Figure 1** shows the domestic market structure for yams.

Commonly, hotels supply yams on credit to hotels, higglers, exporters and other markets. Large hotels, in particular, pay producers over extended periods; up to 3 months. Higglers and supermarkets generally pay producers within 10 days to 1 month. Trading with higglers is very risky for producers as many higglers prefer to negotiate prices (after sale) based on turnover of the produce and profits.

Figure 1 Domestic Market Structure for Yam in Jamaica



6.0 Export Markets

Jamaica is considered to be a major exporter of yellow yams. Yellow yam represents the largest non-traditional export crop in Jamaica exporting to the United States, Canada, United Kingdom and Kenya. Sweet yams are also in high demand, however, planting material is not readily available to support significant production. The bulkiness of yams, perishable nature and associated transport costs make the export of yams expensive and for this reason Jamaica primary export markets are not fully supplied. For shipping to international markets, yams are normally packaged in cartoon boxes with either shredded paper and or saw dust. Miniset yams are preferred for the export market as it is smaller (1.5 lbs. in weight) and easily packed and regular shaped. The small yams are not cut and, therefore, have a longer shelf life and lower post-harvest weight loss. Producers supply produce to exporters on credit and receive payments between 10 days to 1 month. **Table 5** shows yam export to international markets in 2012. **Figure 2** compares the volume of export to international markets. **Table 6** shows challenges in marketing Jamaica produced yams in export markets and opportunities for PROPEL.

Table 5 Jamaica Produced Yam Exports to International Markets in 2012

Country	Quantity (million Kg)
United States	7.4
Canada	1.6
United Kingdom	0.7
Kenya	0.3
Total	10

Source: Ministry of Agriculture and Fisheries, Jamaica

Figure 2 Comparison of Volume of Export to International Markets

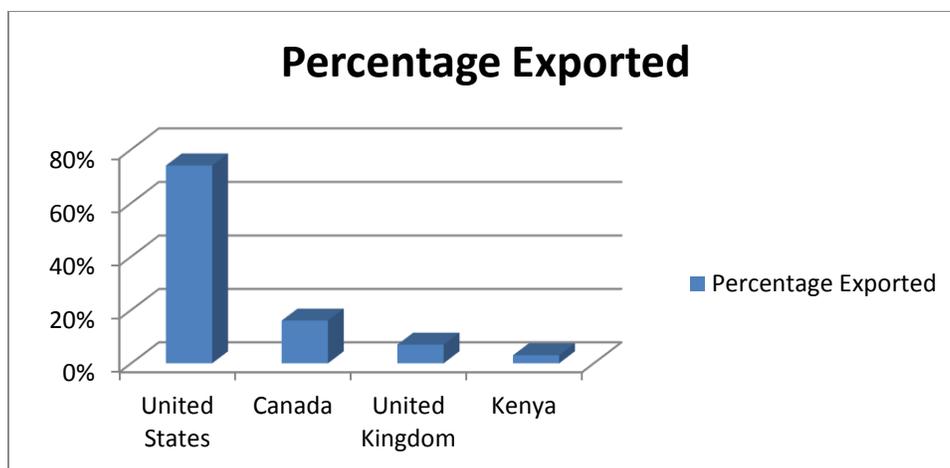


Table 6 Challenges in Marketing Yams and Opportunities for PROPEL

Challenges	Opportunities
Yellow yam, in particular, is in high demand in countries like the U.S. and UK, where many Jamaicans also reside, however, inconsistent quality and supply are constraints in supplying the produce to the export markets. Cutting yam heads and other physical damages that occur during harvesting reduces shelf life of the produce.	Training in crop scheduling, selection of production sites and post-harvest handling are important to assist producers to respond to market needs. Training, technical support and regular monitoring is necessary to support producers to improve their standards of practice and respond to market needs. Minisett yams are more suitable for the export market as it does not require cutting of the heads and chemical treatment.

7.0 Pricing

The price of Jamaica produced yam has been increasing. During the latter part 2004, yams were scarce following the passage of a tropical storm. The price of yams also soared as demand was extremely high. Although average price for yellow yam dropped in 2005 and 2006, the years also recorded higher prices than in 2002 and 2003. Generally, the price of yellow yams continued to increase steadily from 2007. **Table 7** shows average price for yellow yam for the period 2002-2011.

Table 7 Yellow Yam Prices for the Period 2002-2011

Year	Price per Kg
2002	48.54
2003	68.98
2004	105.47
2005	77.06
2006	72.23
2007	127.24
2008	131.76
2009	94.93
2010	119.35
2011	100.34

Source: Ministry of Agriculture and Fisheries, Jamaica

8.0 Additional Information

Additional information on yellow yam and other fresh produce sub-sectors in Jamaica can be found on the following sites:

[Analysis of the Jamaican Fresh Agricultural Produce Industry Supply ...
www.jsif.org/img/Draft_Supply_AnalysisREDI.pdf](http://www.jsif.org/img/Draft_Supply_AnalysisREDI.pdf)

[Jamaica Gleaner News - Solar yam stakes increase yield - News ...
jamaica-gleaner.com/gleaner/20100512/news/news2.html](http://jamaica-gleaner.com/gleaner/20100512/news/news2.html)

[Ecological and Cultural Requirements of Yam - ViCARP - Google Sites
sites.google.com/site/.../ecological-and-cultural-requirements-of-yam](http://sites.google.com/site/.../ecological-and-cultural-requirements-of-yam)

[Improved fallow and live-staking of yam using Gliricidia sepium in ...
www.regional.org.au/au/asa/2004/poster/2/3/1265_ernestj.htm](http://www.regional.org.au/au/asa/2004/poster/2/3/1265_ernestj.htm)

[Substituting wooden sticks with plastic stakes in yam production in
www.calameo.com/books/0011286830642405e869f](http://www.calameo.com/books/0011286830642405e869f)

[Propagation of yams using Minisett technique :Method ... - YouTube
www.youtube.com/watch?v=qsvzd1Dx9go](http://www.youtube.com/watch?v=qsvzd1Dx9go)

[Propagating yam through minisett - YouTube
www.youtube.com/watch?v=c6OGaEV4N94](http://www.youtube.com/watch?v=c6OGaEV4N94)

[Adoption of yam \(Discorea spp.\) minisett technology in delta state ...
www.degruyter.com/view/j/ats.2012.45.../v10295-012-0014-7.xml](http://www.degruyter.com/view/j/ats.2012.45.../v10295-012-0014-7.xml)

[Training Day on **Mini-sett Yam** Production at Bodles Agricultural ...](https://books.google.com.jm/books?id=uMcqAAAAYAAJ)
books.google.com.jm/books?id=uMcqAAAAYAAJ

www.ajol.info › [Journal Home](#) › [Vol 4, No 1 \(2008\)](#)

10.0 Recommendations for PROPEL Interventions

Activity	Immediate/Medium Term	Long Term
Planting Material	Establish result demonstration plots for mini-set yellow yam planting material.	Facilitate CPGCA and other tissue culture labs access to funds for Temporal Emersion Equipment for increasing production and availability (year round) of disease free yellow yam (Black Wisp) and sweet yam minisett cultivar
Establishment	Develop Yellow Yam production manual.	Collaborate with Ministry of Agriculture and Fisheries (Bodles Research Station) to conduct and or facilitate research on fungal and bacterial diseases affecting yellow yams.
	Facilitate access to soil testing or access to funds and support to procure soil testing kits for producer groups.	
	Facilitate training in crop scheduling, selection of production sites and post-harvest handling and monitoring to ensure producers meet market demands.	
	Demonstration plots for alternative methods for yam staking to deforestation.	

Section 4 – The Onion Industry

1.0 The Onion Industry in Jamaica

The onion industry is not well developed in Jamaica, despite efforts to boost production since 2009. From 2011, local onion production increased significantly to meet about 12% of domestic demand. Similarly, onion importation represents a significant portion of food imports in other Caribbean countries and some countries are making efforts to produce the crop locally. Import substitution to meet the demand of the ready market can have significant impact to propel growth of the industry in a short time. The country aims to be self-sufficient in onion production in 2015.

2.0 Production and Production Areas

Onion production in Jamaica has remained at low levels while importation remained high. In 2009, the Government of Jamaica introduced the FARM (Financial Access for Responsible Members) programme which focused on onion and other produce production. The main producing areas in Jamaica are St. Elizabeth, Trelawny, Clarendon and St. Thomas. St. Elizabeth produces about 70% of locally grown onions. Through the Agro Invest Cooperation, five agro parks were also established for onion production by the Government of Jamaica. The number of onion producers is increasing and about 200 are currently involved in production. Producers are affected by the high cost of production, pests and diseases, praedial larceny, low returns and limited access to supplies, particularly herbicides.

Over the last decade, onion production was very unstable. In 2004, production decreased by 67% when compared to the 2003 and continued to decline up to 3 years later. The decline was attributed to improper agronomical practices, pests and diseases and increased cost of production. There was a 47% increase in 2008 when compared to 2007. During the decade, the highest production levels were reached in 2011 and 2012. **Table 1** shows onion production levels in Jamaica for the period 2003-2012.

Table 1 Onion Production in Jamaica

Year	Production (Tonnes)
2003	602
2004	402
2005	311
2006	234
2007	215
2008	455
2009	721
2010	555
2011	1015
2012	1088

Source: Ministry of Agriculture and Fisheries, Jamaica

3.0 Grades and Standards for Production

In 2011, Agricultural Cooperative Development International/Volunteer Overseas Cooperative Assistance (ACDI/VOCA), in collaboration with USAID, the Ministry of Agriculture and RADA, established standards for local onions. Training programmes were also conducted for farmers' groups registered with RADA and interested and involved in onion production. Over 9,000 producers participated in training. **Figure 1** shows grades and standards for onion production in Jamaica.

Figure 1 Grades and Standards for Onion Production

Ministry of Agriculture & Fisheries

GRADES & STANDARDS



ONION

Scope: Onion (*Allium cepa L*) quality is primarily based on the firmness, colour (yellow, white, or red), shape, dryness, maturity, degree of pungency, freedom from neck and scale greening, decay, bruises, sprout, root growth, doubles, diseases and other defects.

Minimum Requirements: Onion shall be of similar varietal characteristics, clean, mature, firm, dry cured and free from diseases.

Dry Cured: The removal of excess moisture from the wrapper scale leaves and neck of the onion.

Standard Specification

Characteristics	Grade 1	Grade 2	Grade 3
Size	Not less than 45mm (1 1/2 inches) in diameter not more than 75mm (3 inches) in diameter.	Not less than 45mm (1 1/2 inches) in diameter not more than 75mm (3 inches) in diameter.	Less than 45mm (1 1/2 inches) in diameter.
Firmness	Firm Onion does not yield to pressure.	Onion may yield to pressure but is not soft or spongy.	Onion yield to moderate pressure.
Appearance	Completely free from decay, bottled neck, watery scales, sprout, root growth, any other defects.	Completely free from decay, bottled neck, watery scales, sprout, root growth, any other defects.	Completely free from decay and sprout.
Colour	Uniform colour, typical of the variety.	Uniform colour, typical of the variety.	Uniform colour, typical of the variety.
Shape	Well shaped, typical of the variety. Not lopsided or otherwise deformed.	Fairly well shaped, typical of the variety. Not lopsided or otherwise deformed.	A range of shapes within the variety.







Unacceptable

Decay	Botrytis Neck Rot	Sprout
		

FACTORS THAT CAN MAINTAIN QUALITY OF ONION or INCREASE SHELF LIFE

Storage Temperature 10°C to 18°C (65 to 70% Relative humidity) between 1 to 8 months






4.0 Crop Establishment and Cost of Production

Planting material (seeds) are imported from the United States, Israel and China by seed distribution companies and sold directly to producers for planting. Onions are normally planted by direct seeding, either by broadcasting by hand or using manually operated seed planters. In some cases, seedlings are produced in seed beds and transplanted into fields to grow to maturity. Planting and harvesting varies in different locations in Jamaica and also depends on the cultivar selected. Typically, the planting season spans;

- Fall planting - September to December
- Spring planting - February to March

Onions mature between 16 to 20 weeks after planting and are harvested at that time for drying. 0.4 hectares yield about 6,800 kg of onions. Materials represent the highest cost in production, about 45%. **Table 2** shows cost for producing onions. **Table 3** shows challenges in onion production in Jamaica and opportunities for PROPEL.

Table 2 Cost of Operations Model for Onion Production Under Irrigated Conditions

Model Size 1 Acre/0.4 Hectare				
			Base Cost	
Activities	Unit	No. of Units	Unit Cost	Total Cost
Labour				
Clearing	Hectare	0.4	35,000.00	14,000.00
Ploughing	Hectare	0.4	12,500.00	5,000.00
Harrowing	Hectare	0.4	10,000.00	4,000.00
Furrowing	Hectare	0.4	10,000.00	4,000.00
Rotavating	Hectare	0.4	15,000.00	6,000.00
Planting	Man Days	2	1,500.00	3,000.00
Weed Control	Man Days	40	1,500.00	60,500.00
Applying fungicide and Insecticide	Man Days	16	2,000.00	32,000.00
Applying herbicide	Man Days	7	2,000.00	14,000.00
Harvesting	Man Days	20	1,500.00	30,000.00
Total Labour				172,000.00 (30.1%)
Material				
Seeds	lbs	4	15,000.00	60,000.00
Foliar Fertilizer		3	5,000.00	15,000.00
Nutrition		1	120,000.00	120,000.00
Fungicide				
Mankocide	Kg	2	1,200.00	2,400.00
Amistar	50 grams	4	1,500.00	6,000.00
Phyton 27	250 ml	1	1,800.00	1,800.00
Mancozeb	0.5kg	4	1,000.00	4,000.00
Ridomil	0.5kg	1	3,800.00	3,800.00
Insecticides				
Diazinon	250 ml	10	600.00	6,000.00
Pegasus	250 ml	5	4,100.00	20,500.00
Newmectin	250 ml	4	4,550.00	18,200.00
Herbicide				
Paraquat	gallon	1	3,300.00	3,300.00
Total Materials				261,000.00 (45.7%)
Other Cost				
Transportation - 5% of labour & material				21,650.00

Supervision - 15% of labour & material				64,950.00
Contingencies - 10% of labour & material				43,300.00
Land Charges (\$10.000/ha/yr)		1	2,500.00	2,500.00
Total Other Costs				132,400.00 (23.2%)
Total Material, Labour and Other Costs				565,400.00
Irrigation cost (5%)				5,654.00 (1.0)%
Grand Total Cost				571,054.00 (100%)
Investment Activities	Unit	No. of Units	Market Price	Total cost
TOTAL COST				571,054.00
YIELD	lbs	15,000		
PRODUCTION COST/kg				38.07
GROSS RETURN	lb	5%	40.00	600,000.00
PROFIT				28,946.00

Table 3 Challenges for Onion Production and Opportunities for PROPEL

Challenges	Opportunities
Producers lack information in pest and disease management and, as a result, producers suffer significant disease/pest-related losses. Beet Army Worm affects many producers in Jamaica. Weed management in onion production is a critical area for which information and training is also required.	Training and technical support can be provided for onion producers in pest management. Demonstration result plots and farmer field schools may also be beneficial for knowledge transfer. A manual can be developed and distributed with information on all areas related to production, harvesting and processing of the crop.
Research is needed to understand and promote the most suitable varieties of onion and crop scheduling for agro-ecological conditions in Jamaica.	Projects can collaborate with existing research facilities to facilitate research and development in variety selection, suitable planting periods and crop scheduling.
Onion seeds are sourced from United States, Israel and China. Shipping and handling cost and markup significantly increases the price of the planting materials which can also be difficult to source.	Support can be provided for local tissue culture facilities to produce onion sets for planting materials, which are expected to be cheaper than imported seeds. Availability of planting materials locally may also allow for more consistent crop production.

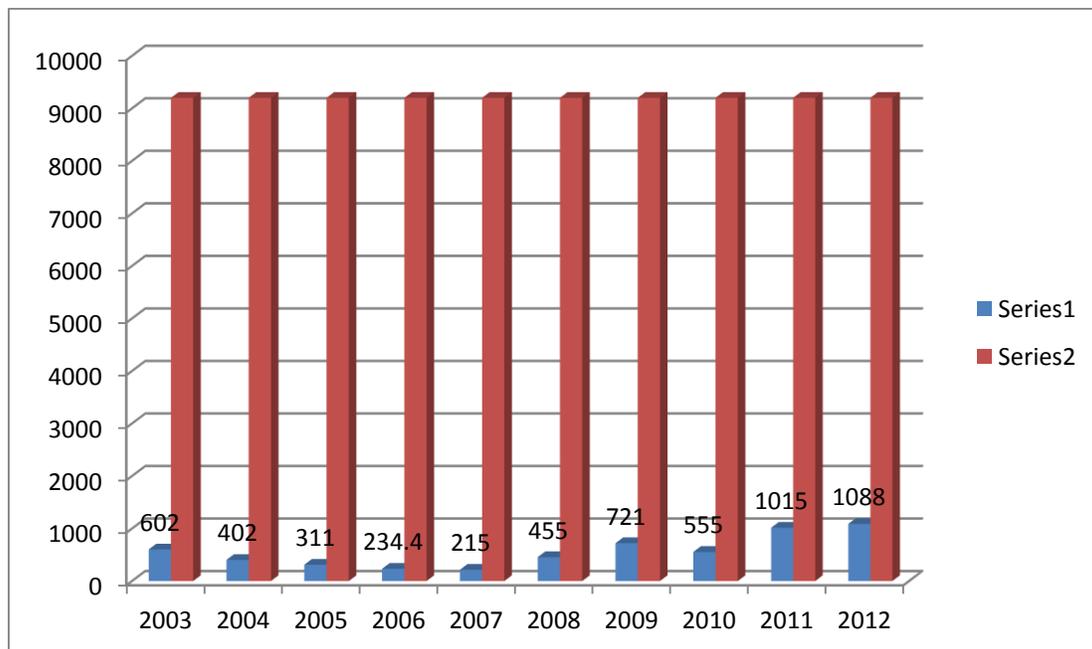
5.0 Technology in the Industry

In Jamaica, a fair amount of technology is used in the onion industry. Tractors are used for land preparation and manually operated seed planters are also used by producers. Micro irrigation systems (sprinkler and drip), fertigation systems and engine operated back pack sprayers are commonly used for watering and liquid chemical administration. Drying is done at a centralized facility owned by private businesses groups in direct sunlight.

6.0 Domestic Markets and Consumption

Jamaica imports approximately 9.2 million Kg of onions annually, which represents about 88% of consumption. Locally produced onions are sold mostly in municipal markets (about 95%). The onions are normally packaged in well aerated bag. **Table 4** shows local onion production compared to consumption. **Figure 2** shows market structure for locally produced onions. **Table 4** shows challenges and opportunities for marketing onions produced in Jamaica.

Figure 2 Local Onion Production Compared to Consumption in Jamaica in 2003-2012 (Tonnes)



Source: Ministry of Agriculture and fisheries, Jamaica

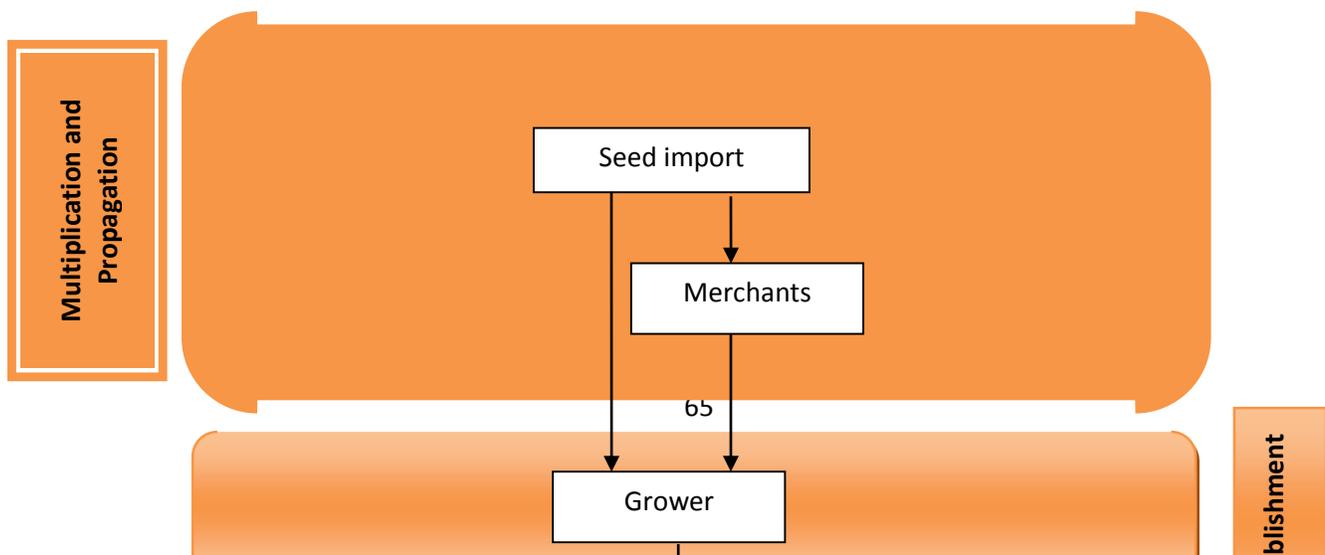
Table 4 Challenges in Marketing Jamaica Produced Onions and Opportunities for PROPEL

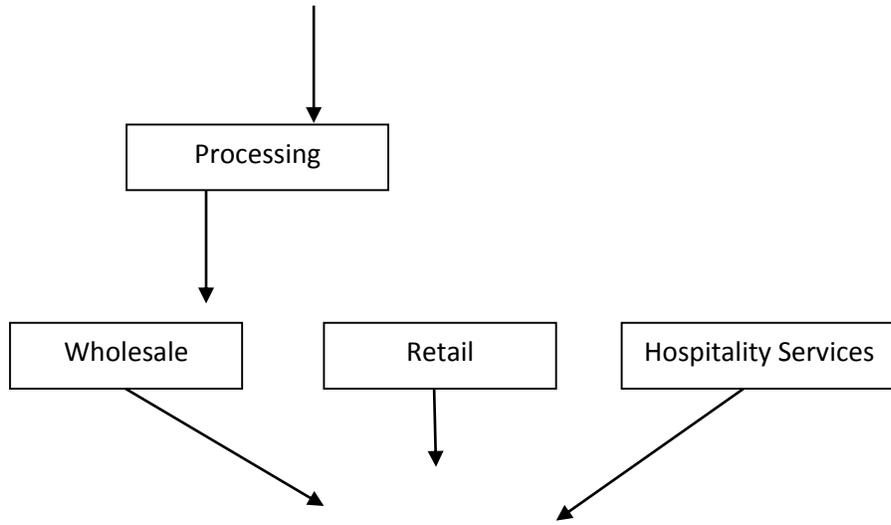
Challenges	Opportunities
Many producers do not handle and store harvested onions properly, resulting in high post-harvest losses.	Training can be provided for producers and processors in best practices to enhance onion shelf life.
Inconsistent quality and supply of onions to markets.	In the current nascent stage of the onion industry's growth, research and development should be supported in areas that present unique challenges and opportunities in Jamaica. Producers should be regularly trained and updated on information, including onion grades and standards, crop scheduling to facilitate continuous market supply, selection of planting materials and post harvesting handling. The media can also be used to disseminate information.

7.0 Transformation of the Industry and Value Chain

The onion industry is transforming slowly as the Government of Jamaica and the private sector is focusing on boosting local production to substitute high importation of the produce. Establishment of agro-parks is most recent initiative to facilitate irrigation and semi-mechanization of production. The number of producers has increased while support is provided by the Ministry of Agriculture and Fisheries for commercial level production and processing (drying) targeting the domestic market. **Figure 3** shows the onion value chain.

Figure 3 The Onion Value Chain





8.0 Recommendations for PROPEL Interventions

Activity	Short/Medium Term	Long Term
Multiplication/ Propagation	Establish result demonstration plots for varying cultivars, including the use of onion sets.	Facilitate the production of sets for crop establishment, which would allow for more consistent crop production.
Establishment	Establish result demonstration plots using varying methods of pest (Beet Army Worm) control and weed management.	Collaborate with Ministry of Agriculture and Fisheries (Bodles Research Station) to conduct and or facilitate research on Beet Army Worm Management in the use of pre-emergent herbicides for weed control strategies.
	Develop onion production manual.	
	Facilitate producers to access credit for and purchase small land preparation equipment in production in areas where mechanization is not available.	
Storage and Marketing	Identify and select farmers and align with consolidators to purchase, store and dry onions for delivery to selected markets.	Facilitate Ministry of Agriculture and Fisheries to access funds to improve agro-parks facilities for post-harvest 'temporary' storage of onions.
	Facilitate training for farmers and consolidators on onion grades, standards and storage.	